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Sternberg's Electro-Magnetic Regulator for Dampers and Valves.

This is an ingenious and scientific device for the automatic regulation of the temperature of public buildings, hospitals, factories, school-houses, dwelling-houses, malt-houses, drying-houses, etc., etc., to any point desired; the automatic regulation of the temperature of any liquid undergoing the process of evaporation or distillation; the automatic regulation of the pressure of steam, so that an engine may be run at any desired pressure; and the automatic regulation of the hight of any liquid in a reservoir from which there is a variable flow, as in a steam boiler.

Fig. 1 shows its application to the regulation of heat in dwellings, public buildings, etc., as will be described below.

Fig. 2 shows its application to the regulation of temperature in heated liquids in chemical and pharmaceutical operations.

Fig. 3 gives a detailed view of the thermometer employed in regulating temperatures in the rooms of buildings.

Fig. 4 is a detailed view of the thermometer employed in regulating the temperature of liquids.

In the latter figure, A represents the bulb; B, a platinum wire fused into the glass, and communicating with the mercury in the bulb; C, the point of junction of the mercury in the stem with a wire, D, which passes through a small aperture in the upper part of the stem. This point of juncture can be raised or lowered as desired by raising or lowering the wire, D.

Fig. 3 represents essentially the same arrangement mounted upon a proper support, and provided with adjusting rollers at the top by which the wire, D, is conveniently raised or lowered till its lower end stands at any desired degree of the scale, and with screws to hold the conducting wires, E F. It is obvious that if the wires, D and B, are connected through conducting wires to the poles of a galvanic battery, the circuit will be made every time the mercury rises to the wire, D, and every time the mercury falls below D, the circuit will be broken.

In Figs. 1 and 2 these wires are shown so connected, with suitable constant batteries. The making of the circuit by the rise of the mercury to the lower end of the wire, D, previously adjusted to the required degree of temperature, develops magnetism in an electro-magnet, which, attracting an armature attached to an unlocking apparatus, releases a train of spring clock-work which operates to close the damper of a furnace, as shown in Fig. 1, or to partially close a gas tap, as shown in Fig. 2, where the operation of heating liquids by the well-known Bunsen burner, generally used by chemists, is shown in progress.

A simple arrangement, not necessary to be dwelt upon in detail, reverses the motion of the clock-work, and opens the damper, or gas tap, whenever the mercury again falls below the end of the wire, D, and the armature is released from the electro-magnet by the breaking of the circuit.

The combustion then increases, and the heat speedily raises the mercury to D, and makes the circuit again. Thus the temperature can never rise above or fall below the degree to which D is adjusted, except to a very slight and immaterial extent while the apparatus is in adjustment.

The clock-work only requires winding for every twenty-four hours of service, but of course this can be so constructed, if desired, as to run a much longer time. Twenty-four hours are, however, ample for most purposes.

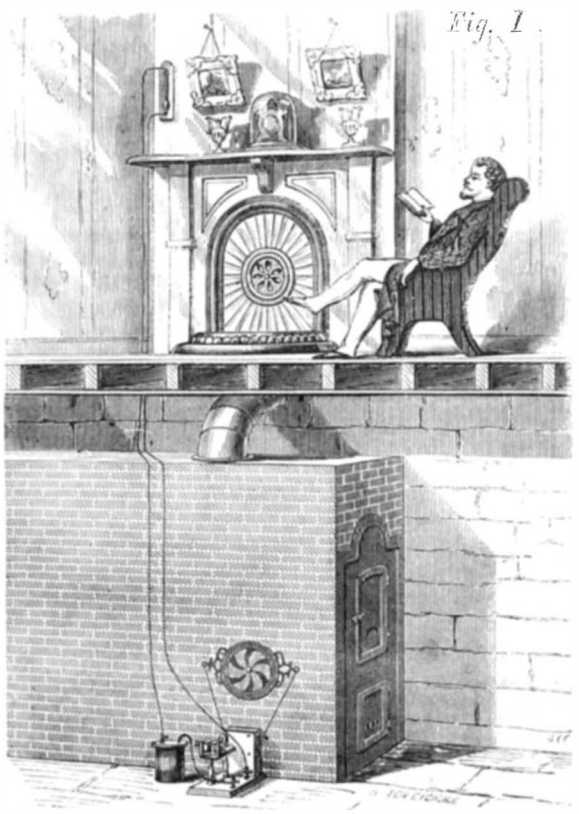
It is obvious that this principle may be extended to a great variety of apparatus and operations in the industrial arts. In fact its possible and useful applications are almost beyond enumeration.

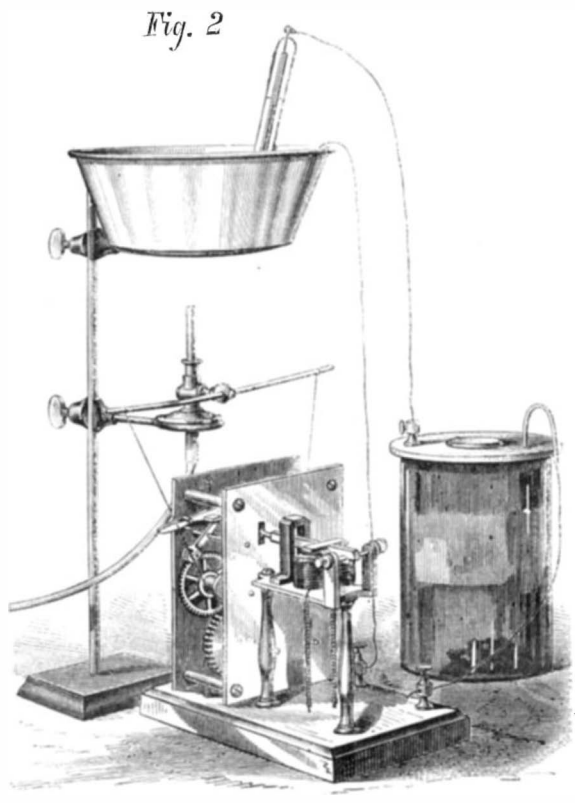
In distilling, especially in fractional distillation, in oil refineries, in green houses, hospitals, school-rooms, churches, in the drying of substances at fixed temperatures, in breweries, and malt houses, etc., etc., its use would change uncertainty to precision, and render easy what are now oftentimes some of the most difficult and critical of industrial operations.

In a sanitary point of view, its general adoption as a regulator of temperatures in dwellings and public buildings seems very desirable.

We have personally inspected the operation of this ingenious instrument in the operation of heating liquids for pharmaceutical purposes, and can vouch that in this respect it is all the inventor claims for it. We see no reason why it should not perform just as satisfactorily in regulating the heat of rooms and in other operations.

The device is covered by several patents, dating from March 1, 1870, to July 12, 1870. The patentee is Mr. Geo. M. Sternberg, No. 19 Platt street, New York city.



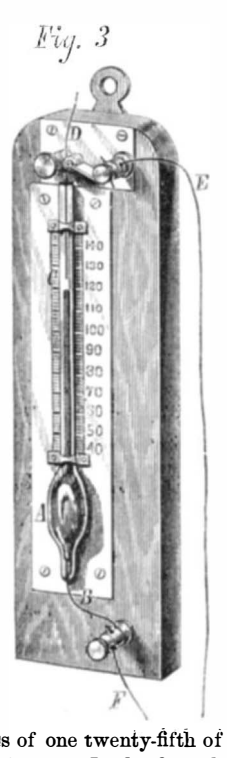


STERNBERG'S ELECTRO-MAGNETIC REGULATOR.

Hirn's Telodynamic Cable.

The following, in reference to the transmission of power by belts of wire rope and pulleys, is from Prof. Barnard's Report on the Paris Universal Exposition. We have already discussed this subject, but its importance entitles it to further consideration.

"The invention of Mr. Hirn was first applied in the transmission of moderate powers to moderate distances. Instead of a cable there was used in the beginning a band of steel, having a breadth of about two and one half inches, and a



thickness of one twenty-fifth of an inch. This presented two inconveniences. In the first place, on account of its considerable surface, it was liable to be agitated by the winds; and, secondly, it soon became worn and injured at the points where it was riveted. It served, however, very well for eighteen months to transmit a twelve-horse power to a distance of eighty meters (266 feet). A cable was then substituted, and this, first introduced in 1852, is still in good condition.

"It was in the attempt to extend the system to greater distances that difficulties and obstacles began to be encountered. At the distance of eighty meters no intermediate supports were necessary. At the distance of two hundred and forty, to which the system was next extended, such supports were found to be indispensable in order to prevent the cable from dragging on the ground. It was only when, after the many trials and failures above mentioned, a material had at length been discovered which rendered these supports indefinitely durable, that this second experiment could finally be pronounced completely successful. After this success, however, the extension of the system went on rapidly. A single firm, Messrs. Stein & Co., of Mulhouse, have applied it in more than four hundred instances with entire success. These applications have been made for the most part in France, and the department in which the invention originated, but there are some noticeable exceptions. The Government manufactory of powder at Okhta, in Russia, mentioned above, has introduced it for the transmission of the force of its turbines over a distance of one thousand four hundred meters. Several establishments in Germany employ it for distances varying from three hundred and fifty to one thousand two hundred meters. An officer of the Danish navy has made one application of it on a line of one thousand meters; and at the mines of Falun, in Sweden, a more than one hundred-horse power is transmitted by it to a distance of five thousand meters (1,608 meters make one half of our miles, so that the latter distance would be nearly three and one eighth miles).

"The invariable success of all the applications hitherto made, over distances constantly increasing, has satisfied the inventor that power can be economically carried by this method as far as to ten or fifteen miles. The experience thus far acquired has furnished data by which the loss attendant on transmission can be very closely calculated. This loss, which will of course increase with the distance, may be referred to three sources, viz.: the friction on the axles of the pulleys, the rigidity of the cable, and the resistance of the air. Experimentally it is found that, for the two great pulleys at the termini, an allowance must be made of two and one half per cent, and for the intermediate pulleys and the rigidity of the cable there must be allowed additionally one per cent for each thousand meters. Thus, for one hundred-horse power carried to a distance of ten kilometers, or six miles, the loss will be $2\frac{1}{2}+10=12\frac{1}{2}$-horse power, or one eighth of the whole; the resistance of the air being still to be added. Mr. Hirn makes allowance for this by doubling the last sum; so that one hundred-horse power may, in his opinion, with perfect certainty, be carried six miles without losing more than twenty-five per cent. This is undoubtedly an under-estimate."

Passage of Gases in the Body.

At the concluding lecture of his course on experimental medicine for the session 1869–70, Dr. Richardson made, says the *Lancet*, a very curious experiment, which appears to show that there is a direct and almost immediate passage of substances in the gaseous form through all the tissues of the body, and especially through the coats of veins. Dr. Richardson introduced a fine tube through the nostril of a rabbit into the cranial cavity. Air, or carbonic acid gas, pumped through this tube, instantly made its appearance in the right cavities of the heart. The carbonic acid darkened the blood and stopped the systolic action. Atmospheric air rendered the blood of the right side arterial, and restored the systole. It seems, therefore, that we are not air-tight.

Improvements in Steam Navigation.

Mr. Jas. Granger, the inventor of a feathering paddle wheel for steamers, illustrated in No. 5, Vol. XIX., of the SCIENTIFIC AMERICAN, writes in answer to C. E. Haskins' query, in regard to the present stand-still in improvements in steam navigation, that the reason is mainly attributable to the fact that attention has been too exclusively directed to the improvement of the old-style wheel and screw, instead of endeavoring to construct other and better means of propulsion.

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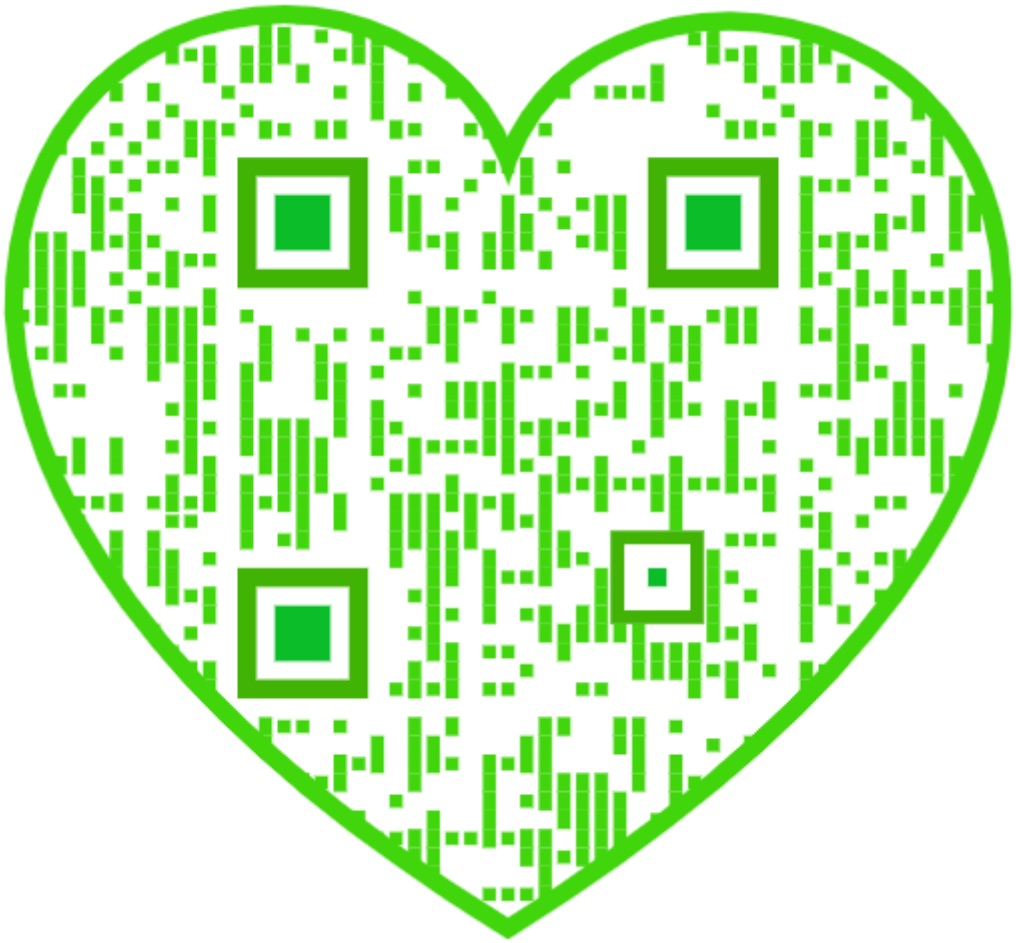

ON THE SCIENCE OF SLEEP AND DREAMS.

From ancient times sleep and dreams have been regarded by philosophers and students of nature with the deepest interest. It is, therefore, the more remarkable that until very recently one of the most important questions in connection with the theme—namely, the cause of sleep and the reason of its periodical return, has been but very imperfectly answered. Two years ago Professor Pettenkofer, of Munich, a gentleman widely celebrated for his researches into the cause of cholera, in the course of his experiments upon the exchange of gases in the human system, gave a perfectly satisfactory reply to the inquiry.

It has long been known that the oxygen taken in during the act of breathing plays a very important part, inasmuch as through its union with the substance of our bodies the vital forces are generated. In every process of life, however insignificant, a certain quantity of oxygen is consumed. It is, in a sense, the steam power by which the living machine is driven, and the amount used can be measured by the quantity of carbonic acid generated and set free in the act of expiration. For this purpose Pettenkofer, assisted by Voit, has contrived an apparatus, and has thereby brought to light the unexpected fact that during the day, even with the slightest efforts, we give forth proportionately much more carbonic acid, or, in other words, consume much more oxygen than we receive during the same period.

From this interesting fact there naturally arises the important inquiry, by what means is this daily deficiency supplied? Here, also, Pettenkofer's researches furnish us with a satisfactory answer. Sleep is the prudent minister of finance, who every night, by a wise economy, makes up the losses of the day, for in sleep we not only consume half as much less oxygen as we do in the day, but we take in twice as much as we do when we are awake. During sleep we lay up a store of oxygen which enables us without fear to look forward to the deficiency of the morrow. Is not this arrangement truly worthy of our warmest admiration? Many a state might congratulate itself if its financial administration were conducted on similar principles. Once more we find that nature is the best teacher, giving us a lesson in national economy from the philosophy of sleep.

We have laid down the principle that in every process of life, no matter how trifling it may seem, we consume a certain proportion of oxygen. Every motion, every sensation, even every thought is such a process. If we shake hands with a friend, if we look at him, or affectionately think of him, our heart beating quicker at the thought, we suffer the loss of a definite quantity of oxygen; a certain portion of our body is consumed and changed into carbonic acid. All this sounds horribly material, but it is, nevertheless, perfectly true, and is sustained by the best possible proofs—namely, those arising from the economy of the human system. During sleep its task is to be sparing of oxygen, and like a wise householder, who avoids all useless and luxurious indulgence, and limits himself to such expenditure as is necessary for his subsistence, it faithfully performs it.

But what are these things which we may regard as the luxurious expenditure of our organism? Above all we must include in this category the whole range of the activity of the senses, since such activity is not indispensably necessary for the maintenance of life. In sleep we may strike off with comfort the charges connected with sight. The muscles of the eyes first refuse their service. A peculiar feeling of pressure and heaviness in the upper eyelids informs us that they are preparing for sleep, and the impossibility of fixing the eye steadily upon any object betrays to us the fact that the muscles which cause the convergence of the axis of sight can no longer p rform their part. With the closing of the eyelids the excitement of the retina ceases, and the nerves of the eye sink into repose.

The next organs which cease their activity during the process of falling asleep are the ears. Possessing no closing apparatus like the eyes they do not so easily enter into a state of rest. Here, so to speak, sleep has to struggle for its rights. The best example of this we may find in our own experience, if we have been so unfortunate, or shall I say fortunate, as to fall asleep under a tedious lecture or sermon. After we have gradually lost the thread of the discourse, and our eyes are enjoying their well-earned rest, the words still continue to sound in our ears, but we are no longer in a condition to recognize and understand them. Gradually they become more confused, and at length end in a dull and inarticulate murmur which seems to withdraw itself farther and farther from us, until at last it is entirely lost.

In the meantime the sensitiveness of the skin begins to be lessened. In vain our friendly neighbor wearies himself to save us from the annoyance of falling asleep by gently pushing us and treading upon our toes. All his efforts fail. Sensation, if not altogether lost, is so materially lowered that it will respond only to strong provocation. The senses of smell and taste cease their activity, and so at length we are pretty well relieved of all our five senses.

At last the muscles controlled by the will sleep also. When we sleep in a comfortable bed we are hardly conscious of this, and the best opportunity for observing it is when wearied by an uninteresting discourse, we must sleep sitting. Who has not been grieved to find the impertinent muscles of his neck suddenly refusing to carry his head upright? And as long as the struggle between sleeping and waking is continued there is exhibited to the mischievous spectator the highly amusing but treacherous nodding of the head.

Thus the body has, like a frugal housekeeper, discharged its obligations, and unsparingly reduced all expenditure for mere pleasure and luxury. But this is not enough; it materially curtails the charges for the nourishment of its tissues and the renewal of its substance. The action of the heart is diminished to a speed varying from three to ten strokes; the blood comes less often into contact with the general structure, and, therefore, imparts to it less oxygen. Naturally, therefore, the functions of the bodily organs generally are limited, and, above all, suffers that very important organ, the brain, of which we must further speak.

The brain is that organ by which we discharge our mental functions. Whether our views are materialistic or spiritual, we must adhere to the principle that mental activity is inseparably connected with the brain. It is the instrument by which the soul manifests its activity, and, as from an imperfect instrument the most skillful performer can produce only imperfect music, so the capabilities of the mind are dependent upon the state of the brain. As in sleep its nourishment is considerably lowered by the diminished supply of blood, so also, as Durham's experiments upon sleeping animals, whose skulls he partially opened, have shown, the arterial, that is, the oxygen bearing vessels, are more contracted and less abundantly filled than in the waking condition, and, consequently, the capability of the brain is much less. Mental activity is reduced to a minimum, and especially must all complicated processes, above all things the judgment, come to a pause. Still our thoughts and ideas continue to spin themselves out even in sleep, according to the same indestructible law as they do when we are awake, but they lack the regulating and limiting conduct of the judgment and the understanding. This partial activity of the brain is to dream.

The dream is not a dark and inexplicable something of whose origin we are ignorant; it is a product of the same brain function which is active in our waking state. Our thoughts in dreaming depend as much upon the association of ideas as they do when we are awake. In accordance with this law every idea immediately on its rise calls up a series of other ideas connected with it by resemblance of circumstance, similarity of sound in the words which express it, or agreement in the order of time, etc. If, when we are awake, we surrender ourselves to the influence of the law of idea association, and do not voluntarily interfere with it, it comes to pass that when we hear a shot we think of the hunt, and then occurs to us the newspaper report that the king has gone to indulge in the pleasures of the chase, and the similarity in sound probably leads us to think of King, the natural philosopher.

In the waking state the judgment always exercises a restraining influence upon the play of our fancy, and prevents us from joining together the unusual and incongruous; but in sleep our ideas are associated in the lowest manner. When we are awake one idea follows another; but when we are asleep, several ideas simultaneously present themselves, and, uniting together, form themselves into one complex whole; or, from the rapidity with which they follow each other, and the indistinctness of their connection, one idea unobserved takes the place of another, and then we see in the above illustration not the king at the hunt, but King, the philosopher, and thus are originated the most wonderful dream combinations, the source of which we seldom succeed in discovering.

In the waking state we can, as I have already said, call up ideas by an effort of the will. We can think of what we wish. This, however, is not always the case. Very often it happens, as if by accident, that ideas spring from the treasure of our memory to which we voluntarily give further entertainment, or by which we are unwillingly led to other ideas distasteful to us. So also in dreams, where the voluntary calling up of any given idea is impossible, the mind is led to involuntary activity by means of ideas stored up in the memory. Most frequently the first impetus to a series of dream-pictures is given by some marked and striking impression which has been made upon us during the day, or by thoughts which have occupied our minds shortly before falling asleep. These ideas are often uninterruptedly continued; but not less often we are rapidly led to other ideas, and we are then unable to detect the connection between the two.

When we are awake the impressions of the senses are by far the most prolific source of mental activity. But in sleep, as we have seen, the senses have ceased to exercise their functions, though still, to a certain extent, capable of excitement. Under strong impressions the senses of hearing and of feeling are susceptible even in deep sleep, but the resulting idea is almost always confused, and often an entirely different image is presented; just as in the twilight we sometimes take the trunk of a tree for a man sitting by the wayside. The indistinctness of the impression made upon the senses allows the fancy to fill it up in its own colors, and so it comes to pass that any excitement of the sense of hearing or feeling in sleep gives occasion for dreams, of which only the most general outline originates in external conditions. There are many examples of this on record. Meyer narrates that he once dreamed that he was attacked by robbers, who laid him full length on his back upon the ground, into which they drove a stake, passing it between two of his toes; but on awaking he found that those two members were only separated by a straw!

Another relates that, having a bottle of hot water placed at his feet, he dreamed that he had reached the top of Etna, and was treading on burning lava. In a similar manner, if we are uneasy in bed and throw off the covering, we dream that in the cold of winter we are wandering half clad through the streets; or, if there is a strong wind blowing, we dream of storms and shipwreck; or a knocking at the door produces dreams of an attack by thieves. It is very seldom that words spoken in sleep are distinctly understood, and equally seldom that they call up in the mind of the sleeper the idea they represent. I may mention an instance or two in which dreams could be controlled in this way. Dr. Abercrombie relates that an English officer who accompanied the expedition to Ludwigsburg in 1758 dreamed, to the great delight of his comrades, any kind of dream they chose, according to the words they whispered in his ear. Another example is given by Kluge: A rejected lover, who had secured the favor of the lady's mother, obtained permission to whisper his name in her ear while she slept. Very soon there was a remarkable change in her conduct towards him, and at last she gave him her hand. On being questioned about the change, she replied that she had become attached to him in vivid and oft-repeated dreams. For the truth of this story we cannot vouch; at the same time we do not deny its probability; and any one who pleases may, as a last resort, try its effect upon the heart of his beloved.

The excitement of the internal susceptibilities gives occasion for dreams almost more frequently than the external senses. By internal susceptibilities I mean those sensations which indicate to us the position of our internal organs, and which are usually known as general feelings, and to which belong the condition of being well and unwell. In perfect health we are not anxious of the action of our various organs. We do not feel that we have a stomach or a heart or muscles, etc.; but as soon as there is any functional disturbance of these members, to say nothing of the pain by which it is sometimes accompanied, we are made aware of their existence by a certain undefined sense of uncomfortableness. These sensations come within our consciousness during sleep, but, as might be expected, darkly and indistinctly. Connected with them in a similar manner as with the impressions of the external senses, are certain symbolic dream-pictures, the most common of which is nightmare. This originates in a cramped condition of the respiratory muscles, and a consequent difficulty of breathing. Similar results will follow if the stomach be overloaded, for it then presses upon the diaphragm, and thereby confines the lungs. When we are awake we trace this disordered respiration to its correct cause—namely, a local affection of the organs of the chest, and there it ends; but in sleep we are incapable of this reasoning, and therefore, in harmony with the law of association, there arises from the feeling of oppression the idea of weight and the image of a superincumbent object. We also dream of heavily laden wagons passing over us, or of dark, shadowy apparitions emerging from the ceiling, and gradually settling down upon us.

Not unfrequently we find that, instead of this, we dream of some great trouble or sudden fright, for in the waking state experiences often render respiration difficult. We then dream, for example, that we are attacked by robbers; and when we endeavor to secure our safety by flight, we find, to our consternation, that our feet refuse to serve us, and we remain, as it were, rooted to the ground. We try to call for help, but find that we are unable to produce a single sound, until at last, after long struggling, the muscles of respiration are released from their restraint, and we awake—sometimes with a loud cry.

In a similar manner is experienced the dream of falling from a great hight. It usually happens while we are falling asleep, and depends upon the circumstance that the gradual relaxing of the muscles caused by sleep is, by some momentary excitement, reversed, and the result is a shrinking back of the body similar to that experienced in falling from any lofty position. Somewhat different from this is the dream of flying. According to Scherner it depends upon our consciousness of the action of the lungs, their rising and falling motion giving to us in our dream the notion of flight. There are a great many more conditions of the body which, if they come into our consciousness during sleep, awake in us, in harmony with the law of the association of ideas, a certain kind of dreams. The emotions also produce a definite impression upon their character. "Great joy," some one has written, "originates a different class of dreams than great sorrow; and ardent love gives rise to dreams not produced by hatred, deep repentance, or an accusing conscience."

If we accustom ourselves attentively to notice our dreams, we shall easily perceive the confirmation of the law laid down. But we shall also find that it is exceedingly difficult to reproduce a dream correctly. It is so for two reasons. The imagery of dreams, in by far the greater number of cases, is so indistinct and shadowy, and in its particulars so inadequate, that, by the effort to recall them, we involuntarily bring to our help the imaginative power of our waking moments, and thereby give to them definite color and outline. The other reason is, the innate tendency of the human mind to look at all things in their logical connections. When our dreams consist of a series of pictures, often connected only by the very loose bond of the association of ideas, we bring to them by their reproduction, unintentionally, of course, a logical connection and correspondence with real life which originally they did not possess.

During the period of deepest sleep the function of the brain is so weakened that we retain no recollection of it, and sound sleep has, therefore, come to be called a dreamless sleep. Sometimes we know that we have dreamed, but are wholly unable to recall a single trace of that which has engaged our sleeping thoughts. But shortly before we awake, when the oxygen stored up in the blood corpuscles begins to bring the process of waste and repair in the brain into more energetic operation, our dreams become more lively and connected, and, for this reason, are more easily retained by the memory. The cases are very few in which dreams are so vivid that we are unable to distinguish them from real events. Professor Jessen, a celebrated physician to the insane, gives a striking example, in the following words:

"One winter morning, between the hours of five and six, was awoke, as I believe, by the head keeper, who informed me that the friends of a patient had come to remove him,

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and at the same time he inquired whether anything required mention. I replied that he might permit the patient to depart, and immediately lay down again to sleep. I had no sooner done this than it occurred to me that of the intended removal of this patient I had heard nothing, but that it was of the departure of a woman of the same name I had been advised. I was compelled, therefore, to seek further information, and, having hastily dressed myself, I went to the dwelling of the keeper, whom, to my astonishment, I found only half clad. Upon my asking him where the people were who had come to fetch away the patient, he replied, with surprise depicted in his countenance, that he knew nothing of it, for he had only just risen, and had seen no one. This reply did not undeceive me, and I rejoined that it must have been the steward who had visited me, and I would go to him; but as I was descending the steps which led to his house it struck me that the whole affair was a dream—a fact, however, which I had not until that moment suspected."

This example is particularly interesting from the length of time which elapsed after the professor awoke, and during which he had been thoroughly aroused by the act of dressing and going to the keeper, yet the delusion which regarded the dream as a reality continued, and at last, without any apparent cause, suddenly vanished.

Proportionately more frequent are the cases where the awaking is imperfect, but still sufficient to induce a course of action corresponding with the supposed realities of the dream. There are instances on record where people, deceived by the alarming imagery of a dream, have committed acts of violence for which they could not be considered responsible.

An interesting example of insubordination during heavy sleep is related by Büchner, in Henke's *Journal of Medical Jurisprudence:*

"Christian Jünger, a soldier of the guards, two and twenty years of age, and who had been three years in the army, a man of good character, fell asleep about noon upon a bench in the guard house. The corporal endeavored to awake him, in order to sweep out the room. Jünger arose, and, without saying a word, seized the corporal by the breast, then drew his saber and made an attack, which the corporal succeeded in parrying. He repeated the attempt, however, and did not desist until disarmed and arrested by the soldiers present; he then sat down quietly upon the bench. On the preceding day, and on the morning of the deed, he had kept guard at an exceedingly cold and exposed situation; the intervening night he had spent in playing at cards, but had drunk little, and in the morning, from sheer weariness, he fell asleep in the heated guard house. On the examination it appeared that he dreamed he was on guard, when a follow seized him by the hair, and took his rifle, upon which he drew his saber and made an attack upon him. Of that which really passed he knew nothing. He could not understand that he, who had always been obedient to his superiors, should have been guilty of insubordination. The medical evidence showed it to be a case of 'sleep-drunkenness,' and he was acquitted."

In explanation of this case something further may be said. Similar results might be brought about by toil of any kind; but here, by keeping guard, and the consequent excessive exhaustion, the deficiency of oxygen was brought to an abnormal hight, and the small quantity taken in during the short sleep was not sufficient to restore the brain to its full activity. The oxygen still remaining was needed to supply the demands of the comparatively insignificant activity of the impulses of the will, so that the deliberative faculties and the voluntary thoughts could not come into play. We frequently see this confirmed when we wish to awake any one out of sleep. Before he come to perfect consciousness he throws himself about in bed, and stretches his limbs, until at last free thought again asserts its authority over the brain, and consciousness is fully restored.

But we sometimes have phenomena presented to us which are the opposite of this. As Aristotle has already remarked, we are often in a position during sleep to recognize a dream as such. An interesting self-inspection of this kind is related by Beattie. "I once dreamed," he says, "that I was upon the parapet of a very high bridge. For what purpose I had come thither I could not perceive, and when I considered that I had not been inclined to such performances, I began to think that it was only a dream. Wishing to be free from this disturbing and tormenting illusion, I threw myself down, in the expectation that I should be brought back to reason by the fall, which indeed happened." In this example the dream occurred shortly before awaking, and the store of oxygen had manifestly reached such a hight that the organ of thought could act in a limited manner, while at the same time the association of ideas produced in the dream continued.

The same thing has been observed by almost every one in the voluntary effort to prolong a pleasant dream just before waking. In this case, also, the organ of thought is fully capable of exercising its function, but we are in a position to control it a little longer, and to permit the fantastic association of ideas commenced in a dream to continue itself. But when once the activity of free thought has broken in upon this play of the fancy all is over with the dream, and we are irrecoverably awake.

We are restored to the waking state when the supply of oxygen has reached its highest point, and the exchange of substance again comes into full operation. It is possible, however, as every one well knows, to be awoke before this by external influences. Any strong excitement affecting either the nerves of hearing or of feeling or of seeing, by the propagation of that excitement places the brain in a condition which promotes a more plentiful flow of blood, and in consequence of this, an accelerated change of substance, which, on reaching a certain stage, results in perfect wakefulness. Sleep requires, as we have observed above, that the arterial blood-vessels should be but sparingly supplied, and everything which increases the supply of blood to the brain not only prevents falling asleep, but disturbs the sleeper. Therefore, all passion and agitation of the mind, all anxious pondering, or bodily or mental excitement—in a word, everything which drives the blood to the head drives away sleep; on the other hand, whatever takes blood from the brain and contracts its vessels is favorable to sleep. It is in this way that cold bandages applied to the forehead are often successful, for cold causes a contraction of the blood-vessels.

In this connection we must not forget the so-called sleep-producing medicines, especially opium and its alkaloids, among which morphia and narcine take the first rank. From certain experiments it has been concluded, and with great probability of correctness, that opium acts upon the vessels of the brain as an astringent, and thus diminishes its supply of blood. But by such means as these we can secure only a smaller consumption of oxygen in the brain; we cannot at the same time cause more oxygen to be taken in and laid up in the blood corpuscles for future use, for just in those circumstances in which we are compelled to resort to such methods of procuring sleep, the capacity of the blood corpuscles for storing up oxygen, as Pettenkofer's researches in cases of sickness have conclusively shown, is diminished. And so it comes to pass that sleep obtained by means of an opiate is never so refreshing and invigorating. In ordinary circumstances the avoidance of the above-mentioned condition inimical to sleep will suffice to procure it. Here habit plays a very important part. Usually we do not wait for the complete exhaustion of the oxygen of the system, but fall asleep, if we have been accustomed to do so, when it has reached a certain limit. For the same reason we are capable of being awoke at any moment. There is always a reserve fund of oxygen, which makes waking possible. In those cases in which, through excessive watching, the exhaustion of oxygen has reached its extreme limit, the sleep following is so deep that before a certain time has elapsed it is hardly possible to disturb it.

It is not always in our power to avoid those things which hinder sleep, and above all it is only seldom that we can exercise complete control over our mental states. To do this requires either a good deal of stoicism, or an uncommon strength of will and power of self-government. It is said that Napoleon I. could sleep at any time he chose, and did so even during the battle of Leipzic. He had the gift not only of controlling his feelings, but also of suspending thought at pleasure. That the last achievement is by no means an easy one almost everybody has experienced. If some thought or plan occupies the mind we cannot sleep, and we must then endeavor to direct our thoughts to those things which excite but little interest; in other words, we must endeavor to become tedious to ourselves. For this purpose there exists the greatest variety of ingenious methods, and as it does not come within my plan to increase the number of them by this paper, I will here close with the hope that it has awakened in the reader an interest in the phenomena of life as manifested in sleep and dreams.—*Ewald Hecker in the Chemist and Druggist.*

How to Make Bone Fertilizers.

The United States Agricultural Department, having been applied to of late by many of its correspondents to issue some general instructions by which farmers might manufacture their own manures, has prepared the following, accompanied by such remarks as would make the manipulation intelligible:

Bones are almost completely insoluble in water—practically so. When very finely divided, as in fine bone dust, a small amount is dissolved by the water of the soil containing carbonic acid, but the quantity is small, and the time taken to do it is great. For the useful effects of bones, therefore, the farmer must dissolve them, and sulphuric acid is alone the most powerful and economical means for that end. It depends on the different form of bone which the farmer operates on as to how much acid will be required. The sulphuric acid used should be of considerable strength, and the farmer should ask for it of the specific gravity of 1·70 or marking 140° Twaddell.

When the acid reaches the bones, the mass effervesces, boils up, and becomes warm, the sulphuric acid taking away two thirds of the lime of the bone from the phosphoric acid, which remains united with the other third, forming a superphosphate, biphosphate, or mono-calcic phosphate, which substance is perfectly soluble in water, and is called soluble phosphate. The sulphuric acid uniting with the lime forms a sulphate of lime (gypsum, or plaster). So that in every heap in which a superphosphate has been made there is always an amount of sulphate of lime (plaster) formed, and the plaster forms the greater portion of the whole mass.

The bones which are used for making superphosphates by manufacturers, or which may be had by farmers, are found in the following conditions: 1. Bone dust or ground bone. 2. Boiled or steamed bones. 3. Bone ash of sugar refineries.

1. BONE DUST.—Before the bones are crushed they are now generally boiled for the sake of the fat, which is sold to the soap boiler. It is of no value as a manurial agent, but is rather deleterious, coating the bone and protecting it from the action of the acid, and it would be advisable for the farmer when possible to boil the bones.

2.—BOILED OR STEAMED BONES.—Bones are steamed for the purpose of removing gelatin or animal matter of the bone for the purpose of converting it into glue. The effect of steaming on bone is therefore to deprive it of some of its organic matter, but it must not be supposed that the whole of the organic matter is removed; a considerable quantity remains, and some ammonia can always be found in such bones when decomposing. A reference to the analysis shows that not more than five or six per cent of organic matter has been extracted from the bone.

3.—BONE ASH.—If bones are burned in contact with the air, the greater part of the carbon is driven off with the other combustible parts of the bone. To avoid this result, which would render the ash worthless for the use of the sugar refiner, the bones are charred in heated iron cylinders, out of contact with the air, by which only a portion of the animal matter is burned off. A large amount of finely-divided charcoal remains, mixed with the bone earth, giving the valuable properties to the bone ash. It has become a great deodorizer and an antiseptic, and capable of condensing gases within its pores, by which means it retains both the ammonia and nitrogen of the soil and the manure. The black color of the bone ash is due to this charcoal.

	Voelcker.		Anderson.
	Bone dust.	Steamed bone.	Bone ash.
Moisture	12·06	8·06	6·10
Organic matter*	31·12	25·45	5·05
Phosphates of lime and magnesia (bone earth)	44·54	60·48	79·20
Carbonate of lime	4·99	3·25	4·05
Magnesia and alkaline salts (chiefly common salt)	1·91	·43	·15
Sand	·38	2·33	5·45
Total	100·00	100·00	100·00
* Containing nitrogen	3·69	1·84	.....
Equal to ammonia	4·49	2·24	.....

One hundred pounds of bones, ground, crushed, or dust (not burned), require forty pounds of sulphuric acid (vitriol). This quantity, if acting solely on the bone phosphate, would remove two thirds of its lime; but, as there is always some carbonate of lime present, this is first acted on by the acid, and thus some of the phosphate escapes decomposition, and remains in the mass as insoluble phosphate; hence, in the mass there are always three constituents, the amount of which it is desirable the farmer should know, namely: The soluble phosphate (mono-calcic phosphate), the insoluble phosphate of lime (undissolved bone earth), and the sulphate of lime. These are the three important substances in a superphosphate, for although ammonia may be potentially present if raw bones have been used, yet a superphosphate is not made or used for the sake of the ammonia; and when bone ash or burnt bone is used, no ammonia is required.

If calcined bones, or bone ash of the sugar-house, be the material used, every 100 pounds will require 87½ pounds of vitriol; when these have fully acted on each other the mass would give: Superphosphate of lime, 26 pounds; gypsum, 66 pounds; sulphate of magnesia, 1½ pounds; soda, 2¾ pounds, and the balance of the 187½ pounds would be water and undissolved bone earth. If the farmer uses steamed bones, a quantity of vitriol intermediate between the two proportions named will be needed, say 66 pounds.

The usual mode of making the fertilizer is to select a good wooden floor of a barn, well covered overhead, or to make a box floor of thick plank, laid tight. On this first throw the bones. If not in dust, it would be well to sift the bones, and place the coarser part on this floor, putting the finer portion aside for mixing in afterwards. By this means the rough bone will come in contact with the strong acid first and be more effectually divided, while the finer parts can then be added to dry up.

No metal (except lead) should be used on the floor, or where the acid can reach. Water equal to one fourth or one sixth the weight of bone is then to be poured on the bone, well stirred in with a spade, and left for two or three days to heat and ferment; it would be well to use the water boiling. Then add the sulphuric acid, mixing well with a wooden spade or board; the mass effervesces, or boils; stir twice a day well for two days, so as to turn the whole mass over; let it stand for two or three days to dry; add the fine bone, and mix well. If not dry, use some absorbing substance, as sawdust, dry peat, or dry earth, in small quantities, and mix well. Do not use for this purpose lime, ashes, or marl, as they would destroy the superphosphate and spoil the whole work.

Made in this way from bone ash, this fertilizer will yield 30 per cent of soluble salts, of which 26 per cent is superphosphate of lime The manufacturer will say that there is 35 to 37 per cent of superphosphate present, but he always over-estimates; indeed, 26 per cent of soluble superphosphates is more than any farmer wants; it is too soluble, and will pass out of his ground too soon, especially in wet weather; 12 to 15 per cent is a better proportion for the farmer, for then he has a proportionally larger amount of insoluble bone phosphate in store for future use in the soil. On this account it is better for the farmer to use raw or steamed bones than bone ash; he has a sufficient, though a smaller, quantity of superphosphate present.

This fertilizer will not suffer from exposure to air, but it must be protected from rain or wet; it ought to be barreled up when not used immediately. This fertilizer, made as directed, will be of a whitish color if made from raw or steamed bone, and gray black if made from bone-black of the refinery; but the color of a superphosphate is of no consequence, and no test of its quality; neither is its smell; it ought to have no smell, or a faint acid odor, if any. One tun of a manure made by the farmer as directed is worth two purchased in the market.

AT the great plow factory of B. F. Avery, Louisville, Ky they turn out five hundred plows per day. Mr. Avery is one of the oldest plow-makers in the country. He worked originally, in 1825, under Jethro Wood's patent.

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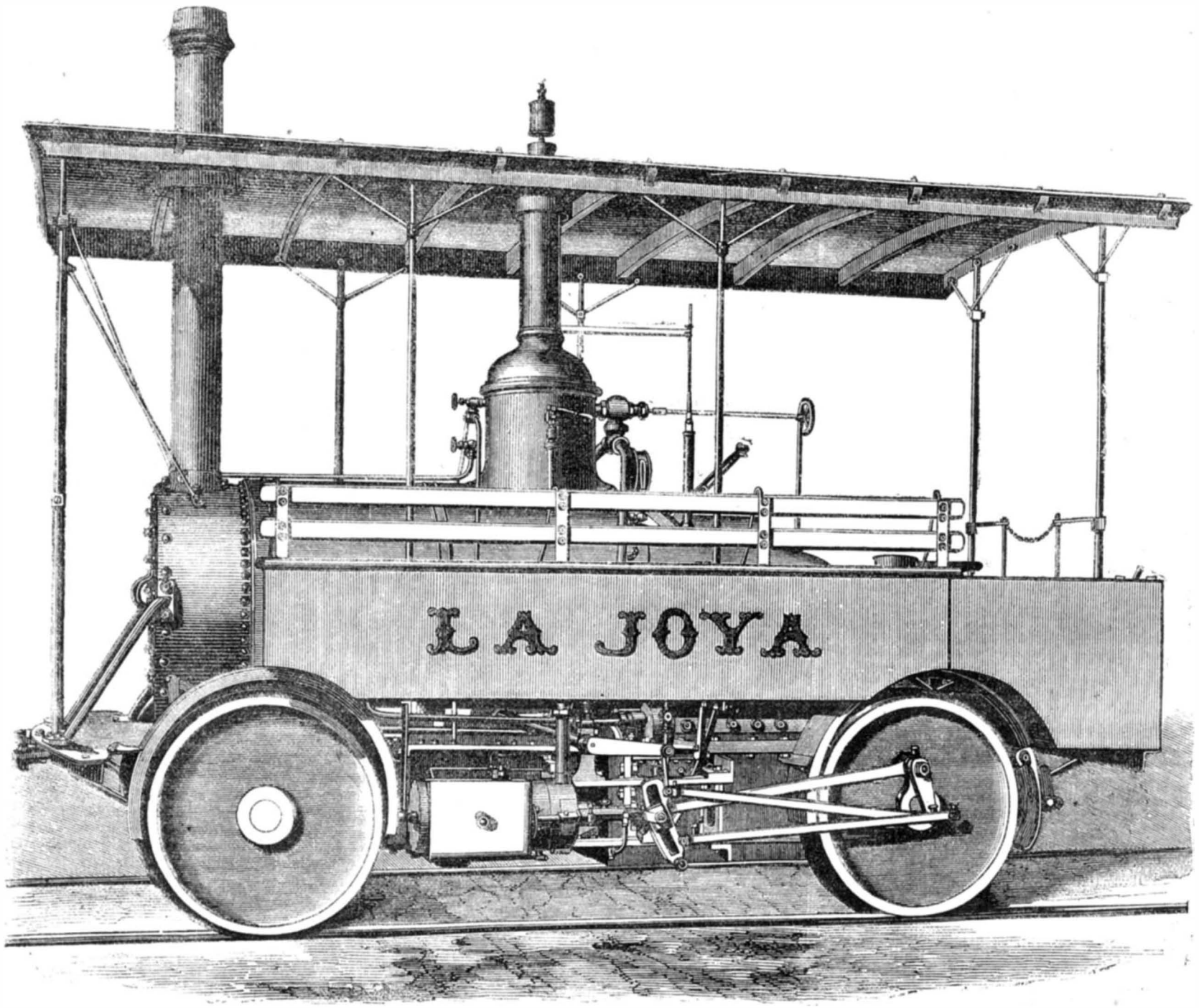
MOUNTAIN LOCOMOTIVE.

The very curious little engine illustrated in the annexed engraving was built for a line in Peru, the grades of which are 200 feet to the mile and over, for thirty miles; it is intended for use instead of hand cars, which cannot be used on such grade. The engine has room for ten or more men on the seats over the tanks on each side, and can also draw a small four-wheel car with materials for repairs of the track. The cylinders are 5 inches diameter by 12 inches stroke, the wheels are 30 inches in diameter, one pair only being driven The boiler is of cast steel, ¼ inch thick. The furnace is 30 inches long, 25 inches wide, and 32 inches deep (inside), the crown of the furnace is stayed with screwed stay-bolts, the same as the sides. The boiler contains 58 1½ inch iron tubes, 4½ feet long. The axles are cast steel; the tanks hold 142 gallons—they are under the seats; the coal boxes—one on each side, at the rear of the tanks—contain 500lbs. of coal.



MOUNTAIN LOCOMOTIVE FOR PERU.

The engines of which this is a type are expected to run from twenty to thirty miles an hour.

The first engine of this kind was built by the Rogers Locomotive Works, Paterson, N. J., for the Copiapo Railroad in Chili. It was smaller than the one described above, having cylinders 3½ inches diameter; 10 inches stroke; four wheels, 30 inches diameter, one pair only being drivers. This engine has been run fifty miles in an hour and a quarter with 270lbs. of soft coal. This seems a very high speed for so small a wheel, but we do not doubt the story, as it comes to us from Mr. E. P. Gould, who was superintendent of machinery of the Copiapo Railway at the time. The company were so well pleased with its performance that the Rogers Works have since built them another one, with cylinders 4½ × 12, and 4·28 inch wheels.

The Tanning and Preservation of Fishing Nets.

The fishing nets on the south coast of England are according to the *Journal of Applied Science*, all well tanned with catechu. There is a boiling house with a large copper, into which they are plunged, and thus dyed a dull brown color. One of the most fertile causes of the rotting of nets is letting them lie in a heap while wet. The fishermen at Scarborough and on the Sussex coast are very particular in drying them as early as possible after they have been used. A few hours lying in heaps causes them to heat, and then destruction commences. Nets that are always immediately hung up to dry after having been used, have remained good and sound after twelve or fourteen years' use.

The nets used by the fishermen on the coast of Sussex are either hempen or cotton, and they are always prepared for service before being used. The mode of preparation is different with each description of net. Those made of hemp or flax are simply well tanned and dried before using. Those made of cotton are first well tanned and dried; they are then dressed well with linseed oil and again thoroughly dried; and finally, they are well tarred and again dried before they are fit for use.

This process not only preserves the net, but gives a stiffness to the meshes which makes them work better when in use. The cotton nets, the fishermen say, are more apt to heat when left in a mass than the hempen ones. The process of tanning is carried on in a good-sized square building, furnished with two large coppers, each five feet in diameter and three feet four inches deep.

The material used is catechu. Besides the large copper there are several square tanks of about the same capacity as the copers, and several puncheons with one head out; these are used for the maceration of the nets when they are too busy to allow them to remain in the coppers.

When the nets are new they proceed as follows: They put into a copper one-and-a-half cwt. of catechu, broken up into small pieces, and a sufficiency of water to admit the nets. This charge of catechu is enough to a fleet of nets; that is, about 106 nets, each net thirty-five yards long. The nets are boiled and then allowed to remain in the fluid twenty-four hours. They are then taken out, well drained, and thoroughly dried. After having been used for six or seven weeks the tanning is repeated, but the charge of the copper on the repetition of the process of tanning is only about one cwt. of catechu to the fleet of nets.

The repetition of the tanning is continued as long as the nets last (they say from five to six years if proper care be taken of them), and all necessary repairs are made with netting twine properly tanned for that purpose. The fishermen say, when they come in, in the morning, and go out again the same day, they do not attempt to dry they nets, but they never suffer them to lie in bulk in the boat, but cast them out on shingle and open them out widely, so that there be not bulk enough together for them to heat. When the season is over they tan them again thoroughly, and then store them away.

The fishermen's clothing, when made of canvas, is tanned previous to wearing, which makes them last at least twice as long. To prepare such articles, an ounce or two of catechu is bruised and boiled in a large saucepan or small copper, in which the clothes are immersed in the same manner as the nets.

Of the Acacia catechu there are two varieties—a white and a red kind; but the cutch, or catechu is almost always prepared from the red kind, the white being seldom cut down. Cutch, or catechu, is prepared thus: The tree is cut down to about six to twelve inches from the ground, and chopped into small pieces, the smaller branches and bark being rejected. The chopped wood is then taken to the place of manufacture generally under trees in the open air, and placed over a brisk fire in mud jars, called *gharrahs*, filled with about two third of water. This is allowed to boil down, till, with the extracted matter, it forms a liquid of sirupy consistence. The contents of several jars are then poured into a larger jar and again placed over a brisk fire for a period of from two to four hours, and, when sufficiently boiled down, it is poured out over mats covered with ashes of cow dung, and allowed to dry. The wood, when dry, is used for fuel.

Abstract Hypotheses.—I have come to the conclusion, says Prof. Vander Weyde, in a recent discussion with Prof. Walling, an equally learned antagonist, that the true road to progress in the science of physics lies not towards abstract hypotheses of caloric fluids, luminiferous or electric ethers, or forces capable of moving bodies, all having an independent existence in space. The index-hand of modern science points in a very different direction; namely, towards the study of *matter* and *motion of matter*, and nothing else, dropping all metaphysical assumptions of which matter is not the basis.

Amber Beads.—Many of these ornaments sold for genuine amber are mere imitations. Beads sold for clouded amber are often but a mixture of gums, which are soft and also easily amalgamated with fatty matters and become dull and dirty on the surface as well as scratched. The false amber is easily shown. Scrape a small portion of the suspected material to powder, and if it dissolves in turpentine, whether hot or cold, it is not amber. Real amber has a smooth, clean feel, and does not scratch readily. Putty powder will restore the polish to real amber.

Dr. R. J. Gatling, the inventor of the celebrated Gatling gun, left for Europe on Saturday, the 6th inst., in the steamer *Italy*.

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[For the Scientific American].

THE MIGRATORY LOCUSTS AND THEIR AMERICAN COUSINS.

[By Edward C.H. Day, of the Schoolof Mines, Columbia Colleg

If the reader will compare the representation of the locust here given with that of the grasshopper in our last number, he will notice, first, that while the antennæ of the latter are very long, those of the former are comparatively short; he will observe also that the female locust wants the sword or saber-shaped ovipositor, and that the male has not the clear spaces at the base of the wing covers that indicate the musical organs of the katydids. He will also discover that the hinder wings have the nervures radiating from the base of the fan-like expanse much more strongly defined—these stiff nervures acting as ribs, and thus affording a firmer support to the membrane, give the locust that power of sustained flight which is the real secret of its existence, in the destructive numbers in which it occurs. This is its advantage in the struggle for existence. The grasshopper, with its weak wings, is limited in its range for food, and the numerical development of its kind is thereby correspondingly restricted; but, as the evidence of Dr. Sincecum shows, with the locust the case is different. That writer tells us of the *Caloptenus spretus*, a species that ranges from the Mississippi to the Pacific, and from the Saskatchewan to Texas, that in Texas "the young were hatched from the egg in the early days of March; by the middle of the month they had destroyed half the vegetation, although the insects were wingless and not larger than a house fly."

It seems evident that had not the most forward of such a host the means, on arriving at maturity, of removing themselves to pastures new, they would speedily eat themselves and their less developed brethren literally out of house and home, and, we may add, their race out of existence. In fact, we presume that vast numbers of them must perish of starvation in their infancy, yet countless multitudes are left to fly off to other regions often very remote; a migration that still leaves enough to propagate the evil in the original locality. And the power of flight possessed by these insects is really remarkable; there are numerous instances, undoubtedly authentic, of their having been met with at sea several hundred miles from land, and, giving currents of air all the credit we can for aid and assistance, yet we must still be surprised at the time such small creatures are able to sustain themselves on the wing.

"If the locusts want the musical apparatus of the grasshoppers, they are not the less," says Professor Blanchard, "good musicians." The difference is, that while the latter perform on instruments *sui generis*, the former are undoubtedly fiddlers; to quote Harris, whose account is at once so full and clear that there is no improving on it, "their hind legs being the bows, and the projecting veins of their wing-covers the strings. But besides these they have on each side of the body in the first segment of the abdomen, just above and a little behind the thighs, a deep cavity closed by a thin piece of skin stretched tightly across it. These probably act in some measure to increase the reverberation of the sound like the cavity of a violin. When a locust begins to play, he bends the shank of one hind leg beneath the thigh, where it is lodged in a furrow designed to receive it, and then draws the leg briskly up and down several times against the projecting lateral edge and veins of the wing cover."

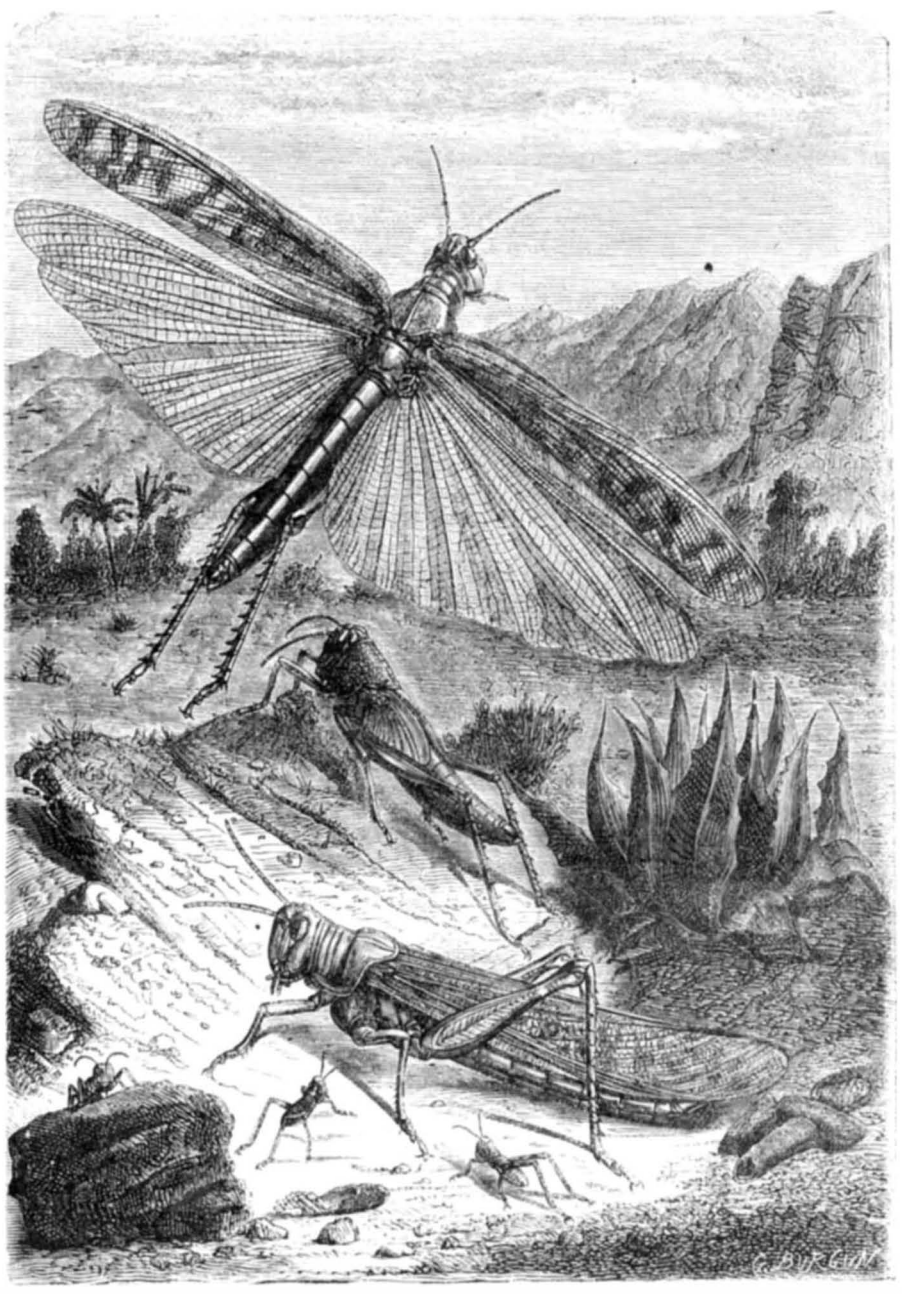
But he has a pair of these violins, so Harris adds: "He does not play both fiddles together, but alternately, for a little time, first upon one and then on the other, standing meanwhile upon the four anterior legs, and the hind leg not otherwise employed."

We have said that the female locust wants the elongated ovipositor of the grasshopper; she has, however, a smaller piece of mechanism by which she is enabled to open a hole in the ground, and into this aperture she gradually inserts her abdomen, depositing her eggs in little tubular cases, consolidated from a sticky secretion. These little cases are represented on the ground behind the female locust in the accompanying cut.

Of the ravages of the locusts, bringing famine and pestilence in their train and causing the death of human beings by the thousand, and it is even said the million, at a single visitation, we have not room at present to select even a few examples. The statements of antiquity have been corroborated by the sad experience of modern times, and the worst species of the Old World are represented by closely allied forms in the New, where we have probably yet to learn the full amount of evil that a wide-spread locust year may do to our rapidly increasing and vital expanse of cultivation.

The most mischievous locusts are divisible into two great genera. The one called *Acridium* (now cut up into several subdivisions) includes the *A. peregrinum*, figured herewith, one of the "migratory" locusts of the Old World and the common red-legged locust of our Eastern States as well as the *Caloptenus spretus* spoken of above. These have on th under side of the thorax a "blunt spine or tubercle," which is absent in the second genus *Œdipoda*. The latter is represented among others by the large Carolina locust that swarms around us at this season, in every walk we take—its dusky wings edged with pale yellow bringing it prominently under notice, and here also belongs the most terrible of the locusts of the Old World, *Œ. migratoria* or the true migratory locust.

Perhaps some of our readers may be prompted to examine the structure of one of these by no means uninteresting insects; if he catches one for the purpose, he will find that the captive resents the seizure by "spitting" upon him. What the nature of this discharge may be we do not know, but it does look amazingly like tobacco juice! The locust "spits" as well as "chews," but it chews the green, clean leaf, and not—well, we won't explain this time, and it spits only in fear and probably self-defense. We never saw one that did chance to fly in at the window desecrate, without provocation, a Brussels carpet or a clean floor, nor if one (quite unintentionally you may be very sure) dropped into a street car, would it celebrate its advent on a lady's dress by expectorating thereupon, that is, if sensibly let alone. We respectfully beg to offer this polite example of a despised insect to all whom it may concern.



METAMORPHOSES OF THE MIGRATORY LOCUST.

From the New York Daily Times.

THE SCIENCE OF GOING TO WAR—HOW PRUSSIA IS SUPERIOR TO FRANCE.

It is scarcely possible to over-estimate the advantage which the Prussians have gained within the last fortnight. They have destroyed the confidence of the French in their generals, and are now pursuing defeated and drooping armies with an elated and overwhelming force. Only very enthusiastic Frenchmen can suppose that the Emperor Napoleon is retiring for tactical purposes. If he could not cover Paris at Metz, he stands far less chance of being able to do so at Chalons. Every inch of ground which he is obliged to give up to the Prussians is an immense advantage to them, and a great loss to him. It is the side which is pursuing an offensive campaign that stands the best chance of winning in the end. When this month opened, Napoleon seemed to have this element of success in his favor. In six days he lost it, and ever since then he has constantly been obliged to recede before the irresistible pressure of the Prussian hosts. That he is out-numbered, we have no doubt. But how will he justify himself before the French people for entering upon a war for which he was so fatally unprepared?

The superiority which the Prussians have thus far shown, they seem likely to retain until the close of the war. Some people appear to suppose that the disproportion in numbers between the Prussian and French armies will disappear as the campaign goes on. We believe, on the contrary, that it will remain very much as it is now—or that if any change be made, it will be in favor of the Prussians. They have a more efficient system of keeping their forces at a given level than the French. As soon as the mobilization of the Prussian armies takes place, depots of reserve are formed all over the country. Supplies of men and horses are dispatched from these depots to the front on the first day of every month, the number being calculated on an accurate estimate, based upon carefully prepared statistics. The soldiers thus constantly gathered in to make up losses in the field are one half called up from the Landwehr—men who have already served, and know their duties—while the other half are recruits. They leave the depots provided with everything they need, so that they are ready for service the moment they reach the front. This is the system which has called forth the enthusiastic praises of every foreign observer who has carefully studied the organization of the Prussian army. Levies of raw recruits cannot cope with a force raised in this scientific manner.

There are the French fortresses, it is true, but they are useless while the French armies are held in check. It seemed impossible, a fortnight ago that Prussia would be able to isolate Metz without an effort. Yet that is what she seems to be doing now. She can afford to detach from her main armies a force sufficient to give employment to the French troops in Metz. The invading force can thus march on, and the army inside Metz could neither follow it nor cut off its retreat if worsted in open engagements. This is the experience of Prussia in the Austrian campaign. She had then smaller fortresses to deal with than she has now, but, on the o her hand, she has larger armies at her disposal. "Josephstadt and Königgrätz," says Capt. Hozier, "did not delay the Prussian armies for a day, though they are both strong places, and would possibly have stood a long siege; but they were both masked by detachments the loss of which from the line of battle was hardly felt by the main body, and though no trenches were opened, and no guns mounted against them, the great line of the Prussian communications passed in safety within a few miles of their paralyzed garrisons." This operation, on a larger scale, the Prussian commanders are now adopting in dealing with Metz. For this, as for everything else, Napoleon seems to be "unprepared." But that explanation will not soothe France under the disastrous blows which are being inflicted upon her.

The Prussian losses are filled up as fast as they occur. The French seem to be under the impression that the forces they first sent into the field would be amply sufficient to finish the war. It was only under the surprise and alarm of the first great reverse that they began to talk of "filling up the void" in the army. Within a month after the Prussian army marched to the field, the first supply of men from the depot reserves was forwarded to the front. There was no waiting for telegrams or orders. The reserves are forwarded at stated intervals, whether they are wanted or not. The French armies have not only been weakened by heavy losses, but further depleted by the necessity of detaching large forces for the defense of Strasbourg, Metz, and other places. Again, the French commissariat system seems to have completely broken down, just as the English system did in the Crimea—when the only breakfast served out to men who had spent a bitter winter's night on the bleak hill sides was green, unroasted coffee. Now the Prussian commissariat cannot fail in this way. It would take too long to describe the method upon which it is organized—but, as was proved in 1866, its success is assured from the first moment of the war to the last.

These are some of the points in which the Prussians have an advantage over the French. They help to explain the many discomfitures already sustained by the French; and incidentally they show how absurd was the sympathy lately expressed for "poor Prussia," because Napoleon had taken her "by surprise." A nation in which every able-bodied man, except clergymen, is obliged to serve in the army, and which has the finest military organization the world has ever seen, cannot very well be taken by surprise. Count Bismarck, while no doubt very thankful for the good wishes which greet him and his cause from this country, must have been not a little amused with the idea that Napoleon had outwitted him, and had forced war upon a country intent only upon the arts of peace.

MACHINISTS' TOOLS.—L. W. Pond, whose advertisement of machinists' tools appears in another column, writes to us as follows: "My works are now fully occupied in the manufacture of my improved tools and machinery, and many concerns contemplate refitting entirely with them, as has in some instances been done already, with great gain in production. The activity now prevailing at my works *is very largely due to my little card in the advertising columns of your widely circulated journal*, which I propose to continue indefinitely.

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Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Racing Boats.

Messrs. Editors :—To one who has never pulled an oar in a modern shell there is yet to be experienced a thrilling and exhilarating sport, never experienced when using heavy oars (weighing as much as three shell spoons); nor when the boat moves slow, preventing an energetic stroke, so characteristic of shell boats; nor when the position of the body, high above the water, places the oar at a bad angle with the water to get a fair pull.

To a great many young men, and lady readers, let me give a few words, and particularly to those living near a river or lake, or within a drive of one. When the writer first took up his residence on the banks of the Passaic, boating there was dormant. I had never been able to enjoy such opportunities for rowing before, and my enthusiasm was kindled by the reports of shell sports on the Hudson. I had the enthusiasm, but not the greenbacks to get the shells. To those who may have the same affliction, and also to those who may be afflicted with want of enthusiasm, but having means, it may be worth stating that it is possible for most ingenious persons to make their own shell boat, and to this end I offer my experience.

I procured two pieces of pine, ¾ inch thick, by 3 inches wide, which, when joined in the middle, made a keel just 30 feet in length, Fig. 1. This I set upon its edge, and rounded it on the bottom, Fig. 2, to fit the skin, or outside of the boat. From a piece of siding (or clap-board) I made the braces, Fig 3, of a width about 14 inches in the widest part, and tapering both ways, until no brace was required. Two braces were made different from those, of one inch thick, and of pine, see Fig. 4. The one nearest the bow, I placed 18 inches from the middle of the boat, the other about 30 inches. The depth of the boat and of these braces was about 5 inches, except that at the ends of the boat, when they can taper down to 3 inches. The two braces, Fig. 4, measuring from A to B, five inches; but from A up to C, 6 inches, or the width of a clap-board.

To make the skin of the boat I got a *basswood* plank (Spanish cedar was *the* wood, but economy was my aim). This plank was sawed and planed as thin as possible, like bandbox stuff. This I cut in lengths, so as to make the seams on the bottom. Break joints, from D to E, Fig. 5, two full lengths on both sides; then piece the ends. This stuff I soaked about an hour, before putting on. I used brass screws, and putting them in bent the stuff over the braces. In doing this, one should be sure that the keel rests on a good level bed, and is held by a piece, Fig. 6, nailed to the floor, or bed, the boat being upside down, and the keel fitting into this piece.

On the ends, over the basswood covering, fit a brass plate, to prevent breaking at the points. Cover the seams on the bottom of the boat, from "stem to stern" with a thin plate of brass (stencil plate stuff), using copper tacks to fasten it.

The boat is now complete except the top, the cock pit, seat, oar locks or outriggers, and spoons. On the top of the braces, all around the boat, fasten a thin strip, like a lath, and on braces, Fig. 4, let this strip fit into on the shoulder, A. Then put on like strips edgewise, from G to H, Fig. 5, to the ends of the boat, cover the whole of the top, with cloth (silicia, or or dress lining) tacking it to these strips. Cover the tack heads with a small bead. Now the boat is entirely closed in, except where the rower is to be seated. Let the seat be fastened to the keel.

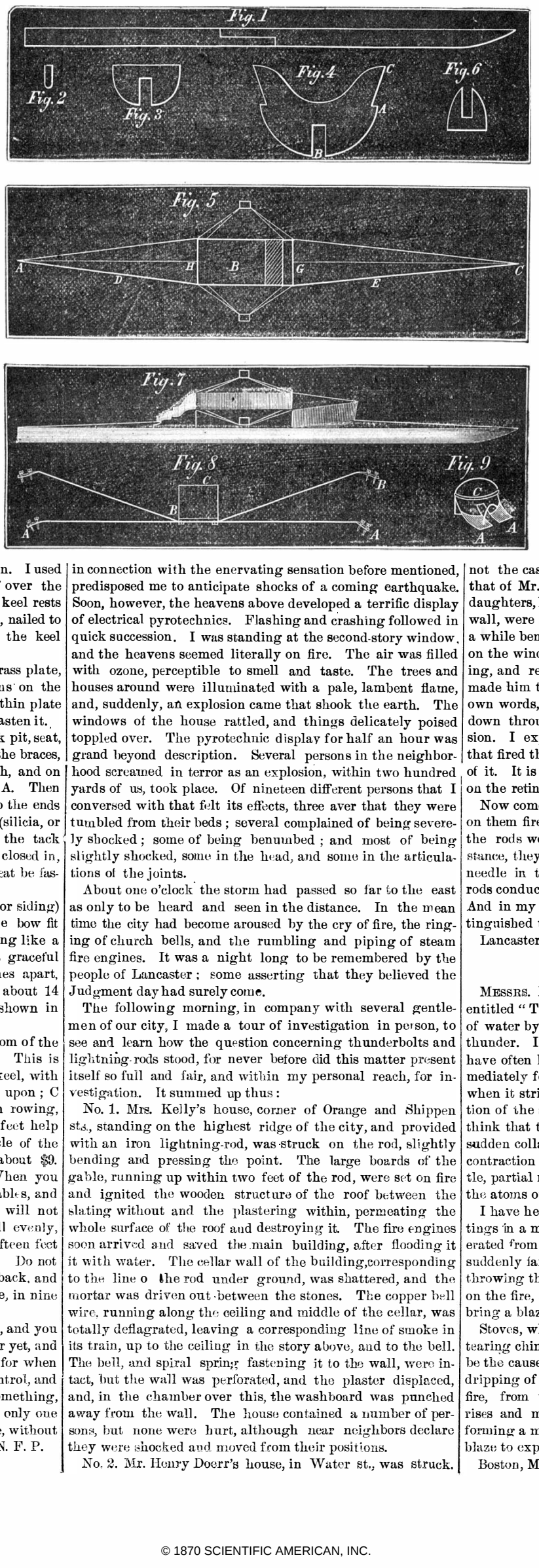
The cock-pit is made by fitting the clapboards (or siding) around the braces, Fig. 4. At the end towards the bow fit two pieces to run out about two feet before meeting like a V, and at the stern let the pieces be formed in a graceful scroll. The irons, or outriggers, are 4 feet 6 inches apart, across the boat; and at their outsides, at bottom, about 14 inches from the water. The irons are made as shown in Fig. 8.

Another little attachment is a foot-board, the bottom of the boat being so thin that the feet must not rest on it. This is shown in Fig. 9. It is like a brace, to fit over the keel, with two pieces of sheet-iron (A A) for the heels to rest upon; C being a strap to pass over the instep, so that, in rowing, when the body goes back to get a full stroke, the feet help to bring into use nearly, if not quite, every muscle of the body. A pair of oars, or spoons, can be bought for about $9. Paint the boat a cedar color; top, a light drab. When you are ready to take a row, take off your watch, valuables, and other unnecessary weight, put on clothing that will not hurt by being wet, and seat yourself carefully; pull evenly, and this little craft, just as wide as your hips, and fifteen feet both sides of you, will fairly glide from under you. Do not look at the passing water at your elbow, but away back, and you will soon be able to row a mile, as I have done, in nine minutes.

Do not be afraid of getting wet when commencing, and you will probably not get a wetting. I have not tipped over yet, and if a person keeps cool, there is no liability to do so, for when the spoons are in your hands, you have complete control, and the tipping is of no consequence, unless you break something, then you are over as sure as a bird in the air with only one wing. I call my boat the *Home-made*, and it cost me, without the spoons, less than $20.

N. F. P.

Paterson, N. J.



Thunderbolts and Lightning Rods.

Messrs. Editors :—On Tuesday night, Aug. 9th, 1870, the weather being warm and sultry, with a display of silent lightning in the north, from early night up to the occurrence of a violent storm, described below, the barometer standing at 29·7°, thermometer at 85°, the air very humid, causing languor and depression of the nervous system, I determined to devote the night to the study and observation of the elements over head.

The humid air seemed to be conducting the surplus caloric of the earth, that it had imbibed through the feverishly heated day, up into the region of clouds, causing its fiery wings to flap as it labored up through the quasi-conducting medium.

At midnight the clouds began to thicken over head, and two thunder clouds, one from the N. W., and another from the S. W., were evidently forming a conjunction immediately over the city. There was very little wind below. The clouds were running low and had a peculiar dingy appearance, which in connection with the enervating sensation before mentioned, predisposed me to anticipate shocks of a coming earthquake. Soon, however, the heavens above developed a terrific display of electrical pyrotechnics. Flashing and crashing followed in quick succession. I was standing at the second-story window, and the heavens seemed literally on fire. The air was filled with ozone, perceptible to smell and taste. The trees and houses around were illuminated with a pale, lambent flame, and, suddenly, an explosion came that shook the earth. The windows of the house rattled, and things delicately poised toppled over. The pyrotechnic display for half an hour was grand beyond description. Several persons in the neighborhood screamed in terror as an explosion, within two hundred yards of us, took place. Of nineteen different persons that I conversed with that felt its effects, three aver that they were tumbled from their beds; several complained of being severely shocked; some of being benumbed; and most of being slightly shocked, some in the head, and some in the articulations of the joints.

About one o'clock the storm had passed so far to the east as only to be heard and seen in the distance. In the mean time the city had become aroused by the cry of fire, the ringing of church bells, and the rumbling and piping of steam fire engines. It was a night long to be remembered by the people of Lancaster; some asserting that they believed the Judgment day had surely come.

The following morning, in company with several gentlemen of our city, I made a tour of investigation in person, to see and learn how the question concerning thunderbolts and lightning-rods stood, for never before did this matter present itself so full and fair, and within my personal reach, for investigation. It summed up thus:

No. 1. Mrs. Kelly's house, corner of Orange and Shippen sts., standing on the highest ridge of the city, and provided with an iron lightning-rod, was struck on the rod, slightly bending and pressing the point. The large boards of the gable, running up within two feet of the rod, were set on fire and ignited the wooden structure of the roof between the slating without and the plastering within, permeating the whole surface of the roof and destroying it. The fire engines soon arrived and saved the main building, after flooding it it with water. The cellar wall of the building, corresponding to the line o the rod under ground, was shattered, and the mortar was driven out between the stones. The copper bell wire, running along the ceiling and middle of the cellar, was totally deflagrated, leaving a corresponding line of smoke in its train, up to the ceiling in the story above, and to the bell. The bell, and spiral spring fastening it to the wall, were intact, but the wall was perforated, and the plaster displaced, and, in the chamber over this, the washboard was punched away from the wall. The house contained a number of persons, but none were hurt, although near neighbors declare they were shocked and moved from their positions.

No. 2. Mr. Henry Doerr's house, in Water st., was struck. This was provided with a lightning-rod on its gable end, running up to, and some distance along the apex of the roof, jutting up two points six or seven feet in hight. The point nearest the gable end was slightly bent and fused, and the roof was fired at the edge where the rod turned over, and where it was insulated with glass. From this point the fiery bolt drove into and on the attic floor, igniting it and charring a surface the size of a hat crown, and a depth of a quarter inch. Mr. Doerr, smelling the ozone and fire, hurried up with several pails of water and put it out. This rod was a wire rope and set in glass insulators from end to end. Mr. McGinnes, the next door neighbor, who was, at the time, fixing his rain-water cask, had his hand singed and received a shock.

No. 3. The house of Mr. Thomas Silvius, situated on the lowest ground in the city, and on a little stream of water, close to the gas works, was struck, not on its highest point, nor on any point, but at the top of the valley formed by the eave of the main building and the top of the back building. The lightning tore up a few shingles, ran from thence down the valley of the conjoined roofs to the water trough, where it encountered a tin fender, placed there to keep the rain water from dashing over the trough, burned a hole an inch in diameter through it, passed thence along the trough to the pipe, and down the pipe, burning holes half an inch in diameter at each overlapping joint, splintering the edge of the rain cask, and exhausting its fury in the water. This house had no rod.

No. 4. The house of Dr. J. P. McCaskey, in Walnut, near Duke st., was struck on the kitchen chimney, the top bricks of which were knocked off, the fluid then passing down the the chimney and displacing a sheet of iron over the fireplace, and another portion taking the course of the stove-pipe, forcing open the stove doors, but doing no further damage. This house had no rod. Several houses within a hundred feet had rods, but were not affected.

No. 5. Mr. Eshback's house, at the North end of Duke st., was struck on the chimney, with no further damage than the displacement of a few bricks. This house had no rod.

No. 6. The Pennsylvania Central R. R. Co.'s telegraph office, in the depot, had its office-connecting wires burned out, and a chair standing near hurled across the floor.

In all this we have the evidence that buildings are struck indiscriminately, rod or no rod. The two buildings that had rods on them were the only ones that were fired, and it might be inferred that they received the heaviest bolts, but this is not the case. Nos. 4 and 5 were apparently slight. No. 3, that of Mr. Silvius, he describes as most terrific. Two of his daughters, having thrown their bed on the floor, and near the wall, were severely shocked, and the one nearest the wall for a while benumbed. Mr. Silvius was reclining, with his head on the window sill, under the water trough of the back building, and received a concussion on the top of his head that made him think for the moment he must die; and, to use his own words, "When I opened my eyes, the fire was raining down through the grape vines." This was an optical delusion. I experienced the same impression in the explosion that fired the Kelly house, being within two hundred yards of it. It is the vivid impression of the electric fire lingering on the retina of the eye.

Now comes up the query, why were the houses with rods on them fired, and those without not? If it were the reverse, the rods would be entitled to some credit; but, in this instance, they have acted the part of incendiaries. Like the needle in the celebrated Prussian and Chassepot guns, the rods conducted the electrical fulminate into the combustibles. And in my fifteen years' observation of them, they have distinguished themselves in that peculiar characteristic.

Lancaster, Pa. Jno. Wise.

Cause of Thunder.

Messrs. Editors :—I recently saw an article in your paper entitled "Theory of Thunder." That is the decomposition of water by lightning, and the reunion of the gases, causing thunder. I am of the same opinion. In proof that it is so, I have often heard the sharp crack of the electric spark, immediately followed by the crashing roll of thunder, that is, when it strikes a rock or some blunt substance. The detonation of the spark is much louder than a rifle. Neither do I think that the crack of the electric spark is owing to the sudden collapsing of the air, but to the sudden expansion or contraction (as in the cracking of rocks, glass, and other brittle, partial non-conducting substances) or re-arrangement of the atoms of the bodies from which and to which it passes.

I have heard of cases of boilers being blown from their settings in a mysterious manner. I have known the gases generated from a smoldering fire in a blacksmiths' forge, when suddenly fanned so as to make a blaze, to explode, violently throwing the coal from the forge. By throwing a little water on the fire, and fanning gently and then strongly, so as to bring a blaze, I can almost always get an explosion.

Stoves, when filled too full, have been known to explode, tearing chimney and stoves to pieces. Why should not this be the cause of boilers being blown from their settings? The dripping of water from a leaky boiler causes the smoldering fire, from which carbureted hydrogen is distilled, which rises and mixes with unconsumed oxygen from the draft, forming a mixture which requires but the temperature of a blaze to explode.

Boston, Mass. Fletcher Symms.

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Speed of Circular Saws and Saw Mills.

MESSRS. EDITORS:—Under the above heading, on page 51, current volume, appears an article from C. H. Crane, stating the amount of lumber cut with a circular saw 66 inches in diameter, running 800 revolutions per minute. As I am filing a circular saw in Messrs. Holt & Balcom's mill, in this city, I thought I would send you the amount of lumber cut in this mill the last week in July, sawing six days and six nights, the mill inside being in charge of Mr. Nicholas Emery.

I will give a short description of the mill, which has one stock gang, 26 saws, 24-in. stroke, one slabbing gang, sixteen saws, 28-in. stroke, one large circular saw, one splitting saw, one gang edger with four saws, and one single edger behind the circular. There are five boilers, 42 in. diameter, 22 ft. long, two 16-in. flues in each. Engine, 24-in. cylinder, 32-in. stroke, runs 70 revolutions per minute. All the saws are driven by friction pulleys, belts running from counter-shafts to saw arbors of edger saws, etc. Each gang has a driving pulley on main shaft of wood 10½ ft. diameter, 30 in. face, the driver pulleys on gang crank shafts are of iron 4 ft. diameter, and 30-in. face, making the gangs run over 180 revolutions per minute.

The circular has a driving pulley of wood 11 ft. in diameter, 30-in. face, and two counter shafts, one front and one back of main pulley, with an iron pulley on each, 4 ft. diameter, 30-in. face, making a double friction on a belt connecting the two counter-shafts. The large belt pulley on counter-shaft is 9 ft. diameter, and pulley on saw arbor, 30 in. diameter, which would make the saw run 693 revolutions per minute, has a 14-in. double belt.

The circular machine was built by Stearns, Clark & Co., at Erie, Pa. The saw arbor is 4 in. diameter, and saw collars 5 in. diameter. The saws are 60 in. diameter, No. 5 gage in center of saw, and No. 8 gage on rim, and made by the American Saw Co., Trenton, N. J., with Emerson's patent movable teeth.

The feed we carry with these saws is from 1 to 5½ in., according to the nature of the wood that it is cutting—our feed averages over 4½ inches to one turn of the saw. I have seen them cut 6 inches to one turn.

Each large saw has 32 teeth. There is an overhead saw, 34 in. diameter. They will cut 7 boards, 16 ft. long, per minute, or 6 boards 18 in. wide, or 4 boards, 24 inches wide, and 16 ft. long, per minute. I have seen them saw a log, making 20 cuts, 16 ft. long, and turn the log 4 times on the carriage in 3 minutes, all strips 1 in. thick and 6 in. wide. The logs that were sawed during the week were not picked logs, but taken out of the boom as they come, running from 12 in. to 40 in. diameter.

By the following table, which was taken from the tally-board for the week, will be seen the number of logs that was sawed on the gangs, and also those saw on circular, and the number of feet they measured:

	No. of logs.	Gangs—night.	No of logs.	Circular—day.	No. of logs.	Gangs—night.	o. of logs.	Circular—night.	Total No. feet.
Mon.....	245	70,621	152	35,743	241	63,578	117	30,050	199,992
Tues	225	71,318	154	38,071	217	62,859	91	22,956	195,204
Wed.....	222	70,882	165	38,098	231	69,120	133	31,690	209,790
Th.....	244	80,210	157	37,070	237	75,313	141	32,599	225,905
Frid.....	256	80,371	162	40,146	237	73,335	139	32,837	226,689
Sat.....	257	81,321	141	40,800	261	77,999	113	30,128	230,248
									1,287,128

There were 4,538 logs cut; over three fourths being 16 ft., rest being 12 and 14 ft. long. Between 6,000 and 7,000 of 2 by 6 were saved on the circular, all the rest were what we call strips, 1 in. thick, and 6 in. wide. There were 150,000 laths cut in the same time with one bolting, and one lath saw only running in the day time.

The day hour commences at 6 A.M., and ends at 6 P.M., ½ hour for dinner leaves 11½ hours. Night tour from 6:30 P.M. to 5:30 A.M., ½ hour at midnight for supper, leaving 10½ hours. The circular lost 3¾ hours' time in all on Monday, Tuesday, and Thursday nights. Gangs lost about two hours' time.

I leave it for the readers of the SCIENTIFIC AMERICAN to say if this equals the sawing done by C. H. Crane.

We could cut 50,000 feet stuff the same dimensions as that which C. H. Crane sawed in the same time with this circular.

Oconto, Wis. LUKE BALCOM.

Poison Oak.

MESSRS. EDITORS:—I notice in your issue of the 13th, an article from a writer in the *Entomologist*, who was suffering from the effects of a vine commoly known as poison ivy. The poison ivy of this country is entirely different in appearance from the poison oak common to the Pacific coast.

The poison oak grows there in the form of a small oak bush, often attaining a hight of four or five feet, and in some cases, has long, slender, vine-like branches. Its poison is much stronger than that of ivy, and will yield to no treatment that I am aware of but iodide of potassa. In the *very* worst cases of poison oak it gives immediate relief, as I have witnessed and experienced.

Any physician or druggist can put up a prescription in proper quantities.

Newark, N. J. ANSON SEARLS.

Moon Fallacy.

MESSRS. EDITORS:—I have seen several articles in your paper in regard to cutting timber by 'moon signs." More than forty years ago, I cut, for a number of years, at different times in the year, considerable second-growth white beech for plane stocks, which I think is the worst wood known to preserve sound (or keep from getting "dozy," as we used to call it). After trying many moony experiments, summer and winter, I came to this conclusion, that the true secret was to cut the timber when there was the least possible amount of sap in the body of the tree—say the coldest weather in the winter or the warmest in summer—June or February, when the sap is in the tops or in the roots of the tree. Every tree I cut after the sap began to start in the spring was sure to "doze," until June, when I found it safe to cut again.

G. W. HILDRETH.

Lockport, N. Y.

To Prevent Cracking of Wagon Hubs in Seasoning.

MESSRS. EDITORS:—In answer to your correspondent E. H. H., of Md., who finds difficulty in the cracking of wagon hubs made from "black gum," I have to say that from satisfactory investigations made with the vapor of coal-tar wagon hubs and stock can be perfectly insured against cracking, shrinking, and swelling, in any climate.

The apparatus is very simple. Take a common "try pot," such as is used by whalers, or a farmer's large boiling kettle; fit to it a wooden cover, to fasten with small screw bolts or clamps to the rim to be vapor tight. A piece of one-inch gas pipe screwed into the cover serves to convey the vapor of the coal tar from this extemporized still to a large cask, which may be set upon one head, as a receptacle for the hubs. The still pipe is led to the bottom of the cask, which is then filled with hubs, and a cover fitted over all, to be vapor tight, with a small safety valve arrangement to regulate the pressure. The kettle is then filled with refuse matter from the gas works or crude coal tar, the cover secured, a fire lighted under the kettle, and shortly the hot lighter vapors penetrate the mass of hubs at a temperature of about 200° to 220° Fah. The hubs are effectually and gradually heated, so that all the watery particles are expelled from the wood in steam and replaced by the light vapors of the hydrocarbon oil. Subsequently the heavier oils are distilled over and fill the pores of the wood. The process is finished in about twelve hours, and you have a hub that will stand anywhere short of a fire. A few experiments will satisfy any one of the efficacy of this treatment. One of the products of this distillation is carbolic acid—the best known antiseptic—and the hubs will be found strongly impregnated with the peculiar smell of this well-known agent.

A large establishment would of course have a more perfect apparatus, but the above will serve to prove its value at small cost. PACIFIC.

San Francisco, Cal.

Seasoning Hubs.

MESSRS. EDITORS:—If E. H. H., of Md., will bore his hubs immediately after they are turned, and paint (as soon as possible after turning) the entire outside with any kind of paint which will effectually prevent the moisture escaping through the outside surface, then give them time to season, the moisture in the process of seasoning will escape through the aperture bored to receive the axle while the surface will be held intact. When well seasoned, mortice for the spokes and drive them in immediately; by doing so he will avoid the cracking of which he complains.

A. GREGG, M. D.

Indianapolis, Ind.

Worms and Insects.

MESSRS. EDITORS:—I have been much pleased and instructed by the able articles appearing in your columns, on various characters of insect life, by Prof. Day, of Columbia College. Some of us, less learned in the homes and lives of the bugs and worms, would be glad to have him tell whence comes and whither goes the new and intensely disgusting worm which has, within a few years back, begun to attack the ailanthus trees. H. E. C.

Brooklyn, N. Y.

[These worms are those commonly called the ailanthus silk worm. They were, we believe, brought from France here by somebody as an experiment. Residents of Brooklyn no doubt wish the experiment had never been tried.—EDS.

[For the Scientific American.]

THE TRUE THEORY OF FLYING.

The world seems to have concluded that the cycle of inventions is complete—that the telegraph has taken the last and topmost place; and that men must be satisfied with the great time and labor saved which they now possess.

But the Duke of Argyle, and a few other brave spirits, think differently, and are spending time and money in endeavoring to obtain for us the art of flying, which has so long bid defiance to human skill.

The writer has been deeply interested in the subject, and perhaps his conclusions may be of service to those who are experimenting upon the art. They are as follows:

1st. No successful flying machine can be constructed, which depends for its support in the air, upon the balloon principle—that is, which requires a bag full of gas for its flotation in the atmosphere. Because, the surface of resistance increases as rapidly as the propelling power is increased—greater weight of engine, etc., requiring greater size of balloon for its support in air. Because this plan has been tried both in New York and San Francisco without a shadow of success. Because it is in direct contravention of the method of nature. Every bird weighs so many pounds or ounces avoirdupois, and the heavier the bird, as a general rule, the more powerful and swift the flight.

2d. The future flying machine must be constructed upon some mechanical principles analogous to those which obtain in nature. Looking at these we find two prime requisites: 1st. A mechanical contrivance adapted to supporting and propelling the flying creature. 2d. A tremendous muscular power to call this machine into action. It would not be difficult to imitate the wings of a bird, with sufficient observance of the laws of mechanics to fulfill the conditions of ascent and propulsion, provided that we could get the power to drive our machine.

A system of properly-balanced and adjustable vanes, inclined on the principle of the propeller-screw will raise a flying vessel in air, and propel her in any direction. But the driving power must be enormous in proportion to the weight of machinery—just as the pectoral muscles of the bird are far more powerful than those of any non-flying animal; or, as far as I am informed, than any other muscles whatever, in proportion to their weight.

The whole question is then—What can we find analogous to the driving power of the wings of a bird? What power is there in nature which we can lay hold on and turn to our uses, which, nevertheless, needs no cumbersome boiler, no heavy fuel, and no complicated, and therefore weighty machinery—all and each of which are death to the flying machine theory.

Let us look at the known agents which we employ in propelling our machines.

There is steam. It requires no argument to show that its power is inadequate to carrying the necessary weight of machinery, etc., in air. Electricity is probably weaker than steam, under these conditions, in its present mode of use.

Either the power required must be concentrated before starting, and deposited in the machine in the shape of a compressed spring, or a cylinder full of condensed air, or we must get some new agent, as yet untried, which will give tremendous power without weight in as great proportion as in the known engine.

The compressed spring or condensed air plan may do for short flights. The writer however, has not much faith in either, and has not the present ability to test them by experiments.

But we have an agent sufficiently powerful and perhaps sufficiently governable, which will drive our flying machine for us with abundant force. Either gunpowder, dynamite, or the fulminates, have sufficient strength, with comparatively no weight. Witness the flight of a five-hundred pound shell for miles, at an elevation of thousands of feet, driven by a few pounds of powder! Consider the number of horse-powers involved in this exhibition of strength, and calculate the weight of the steam engine, its boilers, and fuel, which should accomplish such a result! There is no question about our having the power, but have we not too much? More than is controllable by human ingenuity?

The flying machine of the future does not need to draw upon these terrible forces to their full extent. Gunpowder and all explosives have limits to their power and are governed by laws, and can probably be used as propelling agents with a safety greater than that of the steam engine.

They are the only known agents which are, in their great power and small weight, analogous to the muscles of the bird.

How this power is to be applied and regulated could soon be ascertained by ingenious and educated engineers. Perhaps it would be well to have a cylinder in which successive explosions should preserve a constant and high pressure, which, by proper machinery, would drive the propelling fans.

Or, if a fulminate is obtainable which condenses to an insignificant amount of liquid immediately after explosion, a pair of iron hinges, as it were, which would expand and contract with great force by these successive explosions and condensations, might furnish the desired means of applying the power.

The rocket is a proof of the power of powder to carry vessels through the air. It is the rudest form of flying machine, and when the genius of man is fully directed to economizing and guiding the great power which is the cause of the rocket's flight, we will have a speedy, practical, and safe flying vehicle which will astonish the world by its simplicity and tardy discovery.

A few misconceptions on the subject may be spoken of. It is generally supposed that a flying machine must be a perilous means of travel. This is not so. If one were constructed on the principle spoken of in this paper, there would be no necessity of its travelling high in the air. A few feet above the ground would suffice, and many known appliances could be added, which would render a fall innocuous. The lower side could be arranged with powerful spiral springs, which would make a concussion harmless, or a system of parachutes could be devised by which passengers could descend to the ground with safety.

Arguing from the analogues of nature, as we find that the largest fish far exceed in size the largest bird, so science will find itself compelled by laws, at present unknown, to limit the size of flying machines to some such ratio with steamers, as obtains between bird and fish. If the largest bird is only one-tenth the length and general dimensions (not meaning bulk) of the largest fish, so, considering the largest steamers to be 500 feet in length, which they will probably not successfully exceed, we can expect flying machines, perhaps fifty feet in length. As the speed of the bird is swifter than that of the fish, so we can look for a greater speed in air, by the same rules, than in water. The flying machine in future will go to Europe in two days, and with greater safety and comfort than the present mode of transit.

They will be swifter, easy of construction, and will come into universal use, though they will be more expensive than other conveyances. Speed and concentrated fuel *mean* expense. As rapidly as the magnetic telegraph, when once invented, overspread the globe, so rapidly will every county and town adopt the new invention of the new future, the *hoplites* of traveling convenience. C.

HE who strikes out a new path in art, science, or literature, secures for himself persecution.

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DIAMOND CUTTING IN AMSTERDAM.

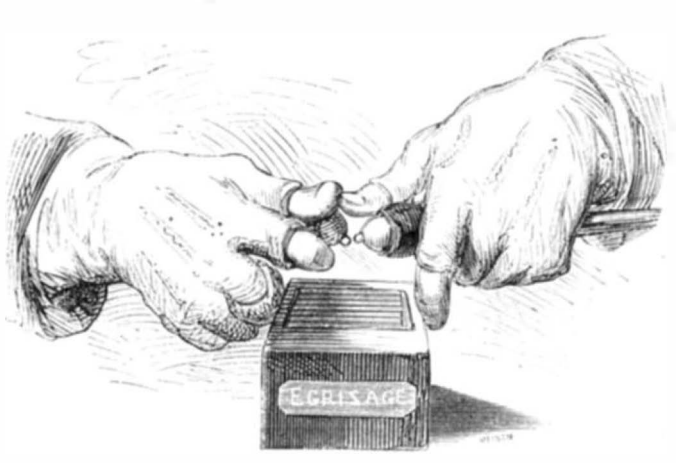
Our readers will recollect an interesting communication from the pen of Mr. J. E. Emerson, published on page 390, Vol. XX., of the SCIENTIFIC AMERICAN, on diamonds and diamond cutting in Amsterdam, Holland, a city famed for this industry, and in which probably more precious stones are cut and polished than in all the rest of the world put together.

Our engravings herewith published illustrate the various processes employed.

FIG. 1

FIG. 2

FIG. 3.



MODE OF CUTTING DIAMONDS.

It must be borne in mind that in the treatment of the most costly substance known to man that only the most refined skill can be tolerated. The lapidaries of Amsterdam are men who undergo a long and severe apprenticeship in the cutting of inferior stones before they are intrusted with valuable gems.

The diamond, like all other crystals, has its lines of cleavage, in which it can be readily split, the process being performed as shown in Fig. 1.

The stone is first examined to determine whether it possesses any flaws or defects, the presence or absence of which will determine the character of the subsequent work. Stones are often divided on account of such defects, which otherwise would be worked entire.

The examination is made by either steeping the diamonds in Canada balsam, oil of sassafras, or anise-seed oil, and being turned around in one or other of these fluids, the changed refraction of light renders the flaws apparent; or the stone may be heated and thrown into water, when it cracks to pieces where the flaws exist.

If, on account of defects or from other cause, it be decided to split the diamond, it is furrowed on the proper plane by a sharp-edged diamond, and the cleaving tool applied to it, as shown in Fig. 1, the diamond being held in position by a strong cement, which fastens it to a block of wood. In regard to this operation Feuchtwauger remarks that "it is made a great mystery." The splitting instrument is of steel and it is operated by striking it upon the back, as shown.

Fig. 2 shows the "Dopp," as it is called, a copper cup with a stem of stout copper wire, in which is fixed a ball of plumber's solder. The upper part of this ball is softened by heat, and the diamond is imbedded therein while undergoing the process of polishing, its position being changed as often as required, by fusing the solder.

Previous to the polishing it is cut into the proper form by hand, as shown in Fig. 3. In this operation the diamond is cemented to the end of a stout stick, about a foot long, leaving only such part projecting as will, when removed, leave the desired facet. The instrument employed for cutting is another diamond fixed in a similar stick, and having one of its solid angles projecting. Feuchtwanger says:

"In order to collect the powder and shivers that are detached during the process, the cutting is performed over a strong box, four or five inches square, furnished with a false bottom perforated with excessively minute holes, in order to sift, as it were, the dust from the shivers; and also with two upright iron pegs, fixed on the sides, for the workman to support and steady his fingers against, while with a short repeated stroke, somewhat between scratching and cutting, he is splitting off, or more laboriously wearing away the diamond in that part where the facet is to be placed. This being done, the cement is softened by warming it, and the position of the diamond is changed, in order to bring a fresh part under the action of the cutting diamond. When, in this slow laborious way, all the facets have been placed upon the surface of the diamond, the cutting is completed. The stone, if examined by a moderate magnifier, now presents ragged, rough edges; and a broken, foliated surface, with a glistening luster on those facets that are nearly in the direction of the natural laminæ, and on the other facets a more even surface, but of a dull, opaque, grayish-white color."

The next operation is that of polishing, shown in Fig 4. The diamond being fixed in the dopp, as above described, is held upon the polishing mill, a simple circular cast-iron plate mounted on an upright spindle, as shown, driven by means of a larger wheel and a belt. The large wheel is usually turned by an assistant. The upper surface of the plate is covered with radial lines or scratches formed by rubbing it with a fine-grained stone. These lines aid in holding the polishing material, a mixture of diamond dust and oil (oil of brick). The stem of the dopp is held by pincers or "tongs" of wood, as shown, weighted to give the proper degree of pressure. The "tongs" have two legs at the end remote from the wheel, which rest upon the table, and pegs of iron serve to steady them during the operation. Sometimes three or four diamonds are simultaneously polished. The completion of a single facet often occupies some hours.

The brief description we have thus given will give a general idea of the processes of splitting, cutting, and polishing diamonds, but an adequate idea of the patience and skill required to do the work in a superior manner, is doubtless only to be gained by personal inspection.

FIG. 4

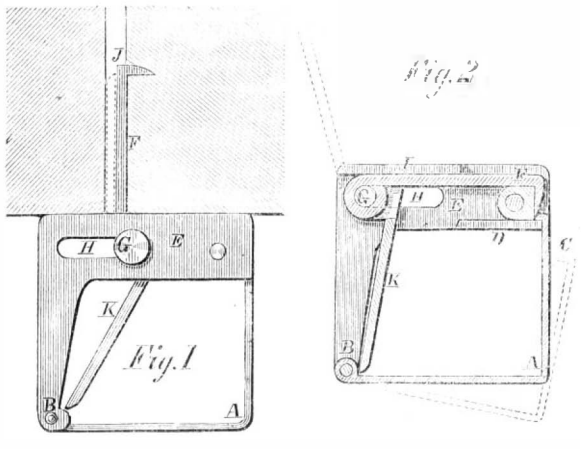
MELENDY'S IMPROVED COMBINED KEY RING AND DOOR FASTENER WITH COMPENSATOR.

Our engravings illustrate one of those simple yet convenient devices which often secure great popularity, while at the same time their parts can be made by machinery at a rapid rate and very cheap, so that they afford a large profit to the manufacturer.

Punching and finishing by polishing comprise nearly all the work on this device, except putting it together.

Fig. 1 shows the device as used for a door fastener, and Fig. 2 shows it as a key ring.

To adjust the parts, as shown in Fig. 1, for a door fastener, the spring bar, A, which is bent at right angles, and pivoted at B, as shown in both figures, and which is provided with a



lip, or catch, C, as shown in the dotted outline, Fig 2, is sprung off from ribs or ledges, D, Fig. 2, formed on the inner sides of the side pieces, E. This allows it to turn on the pivot, B, and drop into the position shown in the dotted outline in Fig. 2.

This being done, the hook, F, which, when in the position shown in Fig. 2, cannot turn on its pivot, G, Figs. 1 and 2, may be thrust along, its pivot sliding on the slots, H, formed in the side pieces, E, till the pivot, G, reaches the end of the slots, H. This releases it from its engagement under ledges, I, also formed on the inner sides of the side pieces, E, and allows it to be opened on its pivot, G, into the position shown in Fig. 1. While in this position, its pivot, G, may be slid along in the slot, H, to its original position. Then the hook, F, being placed between the edge of a door and the jamb, so that the jaw, J, is towards the jamb, closing the door will drive the jaw into the wood. The body of the apparatus being then slipped along on the pivot, G, into the position shown in Fig. 1, it abuts against the door, so that the latter cannot be opened by any one outside, except by tearing out the wood of the jamb.

Should the door have shrunk, so that it does not press sufficiently against the hook, F, to force it into the wood, the compensator, K, also pivoted on G, is turned up to the back of F, as shown by the dotted outline in Fig. 1, so as to fill up the space left by shrinkage.

When the bent spring-arm, A, is opened, as shown in Fig 2, and in the manner above described, keys may be slipped upon it; the arm clasped again will hold them securely.

This device has been made the subject of two patents, dated respectively, May 17, and July 19, 1870, both issued to B. H. Melendy, 36 Walnut Street, Manchester, N. H., through the Scientific American Patent Agency. For further information, communications may be addressed to him as above.

Electro-Typographic Machine.

A new electro-typographic machine, the invention of M. Henri Fontaine, a French barrister, is now at work in one of the public offices in Paris. The object of this machine is to print off with economy and rapidity the quantity of short papers required in law courts, public and private offices, or commercial houses, now executed by the longer and more expensive processes of printing or autography. The machine of M. Fontaine, like the electric telegraph, is on the principle of substituting fixed for movable types, one type only being employed for the same letter; thus dispensing with the ponderous and bulky movable types of the printer. Steel types, representing the different characters used in printing (capitals, small letters, italics, etc.), are ranged around two horizontal disks, placed one over the other. Above these is another metallic circle divided into notches corresponding with the type below. By a very simple machine, as the handle or bar in the center presses against the notch representing the letter required, an electric shock lowers the type upon a sheet of paper rolled around a cylinder placed beneath, prints the letter, and again returns to its place. The operation is so rapidly performed that a hundred letters may be easily printed in a minute. When completed, the paper is transferred to the lithographic stone to be worked off. The great recommendation of M. Fontaine's machine is its great simplicity, the ease and rapidity with which it is worked, its convenient size (about three feet by two), and its moderate cost. The typography is remarkably clear and distinct, from the employment of finely engraved steel types.

JOSH BILLINGS thus speaks of a new agricultural implement, to which the attention of farmers is invited: "John Rogers' revolving, expanding, uncerimonious, self-adjusting, self-contrakting, self-sharpening, self-greasing, and self-righteous hoss-rake iz now and forever offered to a generous publik. Theze rakes are az eazy to keep in repair az a hitching post, and will rake up a paper of pins sowed broad kast in a ten aker lot of wheat stubble. Theze rakes kan be used in winter for a hen roost, or be sawed up in stove wood for the kitchen fire. No farmer of good moral karakter should be without one, even if he has to steal one."

FAIR OF THE SOUTHWESTERN VIRGINIA AGRICULTURAL SOCIETY.—The second exhibition of this association will be held on their fair grounds near Wytheville, Virginia, commencing on the 27th of September, 1870, and continuing four days. A large list of premiums is offered. The secretary of the society is Alex. S. Mathews.

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To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums in the country.

THE USES OF SULPHUROUS ACID.

This acid has assumed a great importance in the arts, and we find the best method for its production the frequent subject of discussion in our works on technology. It is employed as a gas, as a solution in water,and in combination with bases under the name of sulphites. There are numerous ways of making the gas, some of which it may be well to recapitulate before proceeding to speak of the applications.

One of the best methods is that proposed by Stolba, to heat in suitable retorts one part of sulphur and four parts of common sulphate of iron. Other manufacturers simply burn sulphur in atmospheric air, or deoxidize sulphuric acid by means of charcoal or some metal. In some instances, sulphurous acid is an incidental product,and is not allowed to go to waste. We do not, however, purpose to speak of the manufacture and properties of the acid, but of its uses.

In Belgium, sulphurous acid, obtained by roasting sulphur, is conducted through heaps of alum slates, arranged on floors, and, in this way, the yield of alum is greatly increased. Under the old process, sixty-eight parts of slate were required to make one part of alum. By employing sulphurous acid, it is said that eight parts of slate will yield one of alum.

In the manufacture of phosphorus from bones, the bones, previously freed from fat, are digested in aqueous sulphurous acid, by which the bone phosphate is dissolved. By boiling the solution, all of the sulphurous acid can be expelled and condensed in coke towers, to be used again. The bones thus extracted can subsequently be treated for glue. In the preservation of meat, sulphurous acid appears destined to play an important part. The meat is suspended in large boxes or chambers and sulphurous acid gas admitted. To prevent the formation of sulphuric acid, it is necessary to have something to absorb the free oxygen, such as the sulphate of iron, in the bottom of the vessel.

In the Paris Exhibition of 1855, we saw specimens of meat exhibited by Laury, which had been kept fresh in this way for five and ten years. Many of the modern processes for the preservation of meat are founded upon the use of sulphurous acid, either alone or in combination with other agents.

In the purification and refining of sugar sulphurous acid plays a most important part. Its effect is not only to clarify the molasses, but also to prevent the fermentation, by which the yield of the sugar is largely increased.

For the extraction of purpurine and alizarine from madder, Kopp proposes to treat the madder with sulphurous acid, and afterwards, with sulphuric acid. The two coloring matters are in this way separated, and the labor of extraction facilitated.

Oils and fats are purified by sulphurous acid. The fat is heated to 500° Fah., and gaseous acid passed through it for about four hours,and,afterwards,the sulphurous acid is removed by steam and water. In the refining of petroleum sulphuric acid is employed, which is partially deoxidized into sulphurous acid, and thus accomplishes the purification of the crude oil.

The preservation of hops, by impregnating them with sulphurous acid, was an important discovery, and, we believe, was chiefly due to the researches of Liebig. The gas destroys the lower forms of insect life and prevents any change in the properties of the hops.

Glue is made from leather refuse by soaking the scraps in running water and afterwards digesting them in strong sulphurous acid, and occasionally changing the water. The colorless jelly thus obtained is afterwards converted into glue.

The value of sulphurous acid,in obtaining iodine from Chili saltpeter is explained in another place. It is capable of a similar application in the treatment of copper ore, also, of the ores of many of the rare metals. Very poor copper ores are capable of being profitably worked by the sulphurous acid process.

In the manufacture of alcohol and spirits from malt, sulphurous acid has been advantageously employed. In the manufacture of sulphuric acid, and for the bleaching of straw goods, sulphurous acid has long been known. In medicine it is a valuable remedy, and rapidly attaining the first rank. For the preservation of wines and cider; to prevent the rusting of instruments; to destroy vermin; and as a disinfectant, we often hear of this acid, and the more we become familiar with its properties, the further will its uses be extended. It is one of the most important agents at the disposal of the chemist.

EFFECT OF ASSOCIATION UPON MENTAL DEVELOPMENT.

Young men, and young women, are generally ignorant of one of the most valuable as well as the most accessible and most cheap of all educating forces—the power of association on mind. This power is not commonly discovered and appreciated till experience teaches it, and when many valuable years have passed. The associations of young people here are mostly formed for the furtherance of pleasurable pursuits and without regard to mental ability or acquirements. No greater mistake can be made by a youth desirous of rising to eminence in any profession. To secure rapid mental growth, one's associates should, if possible, be chosen from those of greater mental power, wider experience, and more varied acquirements, than he himself possesses.

The profession of teaching affords many instances of the effect of constant association with inferior minds. In this profession, unless special care is taken to avoid mental contraction by occupying the mind with topics out of the usual routine, and which call into play all the faculties of the mind, men become dwarfed in intellect, and find themselves at an age when the mind should have attained its fullest vigor, less able to grapple with difficult and original trains of thought than at the outset of their professional career. It is chiefly because of the educating power of association that schools are more efficient than private instruction for youth. A young man entering college goes there not alone to learn Greek, Latin, and the sciences, but to learn human nature, to acquire self-control, to rub his wits against other wits, to encounter and resist the temptations which will beset him in after life.

All this constitutes a sharp discipline which some do not escape from unhurt. Those who do, however, are men who, having been educated by association, know the peculiarities of men in general, and are able to penetrate and understand the motions which influence action. They are not likely to fall an easy prey to deception or to over-estimate the men they encounter in active life.

This view of association as an educational force has an important bearing on the subject of schools for both sexes. Perhaps no single educational topic has given rise to more widely divergent opinion than the question of educating the sexes together or apart. So far as those who approve the mixing of the sexes in schools base their opinion upon this alleged comparative inefficiency, the admission of the power of association to educate seems to us to completely refute such an allegation. Even if it be admitted (we are by no means prepared to make such an admission, however) that these schools show at their examinations less progress made in book studies, we believe that important ends of education are subserved, which more than compensate for such deficiencies.

On this account we favor the tendency of the age to admit to colleges, seminaries, and schools, whether technical or otherwise, all students of both sexes who may desire such admission.

It is perhaps somewhat singular that in technical schools those devoted to medicine and surgery should be among the first to feel the demand of females for greater educational facilities, and to have acceded to this demand. So great a triumph over superstition and prejudice is an honor to the age. The questions of the equality of the sexes, or the mental peculiarities of each, have, in our opinion, nothing to do with the higher and more important one of equality of opportunities. Grant the latter equality, and the question of general equality will soon be settled.

WHO MAKE MISTAKES?

"Everybody," will be the reply from every one whose eye catches the above heading. A true answer, indeed. From Solomon, reputed wise, but often foolish, down to George Francis Train, often called foolish, but who not unfrequently speaks wisdom—everybody has made, and everybody will make mistakes. Adam and Eve could not live long in Eden without making a mistake, which the whole human family ought to deplore, if indeed their mistake was the cause of all the mischief in the world, which perhaps there is reason to doubt.

But who make the greatest mistakes and the most numerous? We answer those who know least, and those who are generally supposed to know most. Those who know least are those who suppose and act upon the supposition that books—the records of other men's thoughts and discoveries—are worthless, who believe in themselves as able to solve the profoundest problems without the help of previously acquired knowledge, and therefore cut and try upon questions which have long since found a thorough solution, and fritter away their time and energy to re-discover what has already been discovered. These men delight in styling themselves *practical* men, which in nine cases out of ten in which the term is used boastfully, means ignorant, obstinate men—men who never can accept an idea with relish unless they can be deceived into the belief that it emanated from their own stolid brains. How often have we seen such noodles cajoled into accepting a statement of fact, simply because some man of tact put it to them as "the same thing in another form," as some tom-fool's nonsense they had themselves uttered a few moments before. "It is only another way of putting it, you know," and, "You were entirely right in your mind about the matter," and you see them straighten up and assume the pride due to a sagacity they do not possess, and brains their skulls are too thick and too small to hold.

The mistakes of this class of men matter little to the world. It is not so, however, with the second class we have named. These are men who, having explored large areas in the field of human learning, give themselves up thereafter to profound speculation, and not content with muddling their own heads with metaphysics, print and publish their speculations to muddle others.

Among these we find the greatest and most hurtful blunders committed because their mistakes are too often accepted as truth by inferior minds.

The class of men who make the fewest mistakes, and even whose mistakes very often serve a useful purpose, lie wholly between these extremes. They are men who gratefully receiving the facts and formulæ discovered and wrought out for them by the illustrious line of workers whose labors have forever ceased, build thereon a sure structure of practical knowledge.

They are the true practical men who do not waste their time in useless original experiment unless they discover defects in the experiments, the results of which have been accepted as truth. Availing themselves thus of the store of knowledge contained in books, they make use of it in the conduct of new investigations or in the application of them to the useful arts.

They are, in whatever degree they thus avail themselves of stored-up knowledge, the true scientific men, who avoid vain speculation and test every proposition by its accord or discord with well-established fact.

They are thus matter-of-fact men, not in the ordinary sense, perhaps, for many of them, among the most brilliant of the class, as Tyndall, Huxley, Faraday, and a host of other brilliant names, have clothed their facts in such beautiful robes of fancy that their lectures are worth reading for their literary merit alone. But they are matter-of-fact in this, that whatever conclusion they adopt must have a solid substratum of fact. These men are at the present day making such a combined attack upon all that has not fact to support it, that superstition, which has long usurped reason, finds itself unable to maintain its ground, and slowly retires before their quiet but determined onslaught.

PEN STAMMERING.

Some time since we called attention to the great necessity of simplifying our present cumbrous system of penmanship We should not, at this time, return to the topic had not our attention been called to it by the perusal of a little work written by A. J. Graham, an expert in short-hand and phonetics, whose abilities have made him well known to all the reporting fraternity in this city.

There is much in this book which is valuable, and the system set forth therein would, if adopted, save much labor. It consists mainly in the use of abbreviations, and when carried out to its fullest extent, will save some forty per cent of the labor of ordinary penmanship. But it does not appear to us to meet the requirements of modern business, be it either commercial, editorial, or clerical. What is wanted, in our opinion, is something that may be easily acquired, and easily understood, yet which shall enable the writer to spell out all words accurately, to punctuate with precision, and yet not occupy more than one half the time employed in ordinary writing. This can only be accomplished by the adoption of more simple letters, not by word contractions.

The simple forms used in short-hand writing are perfect in simplicity and legibility, and, when written out in full, give as graceful combinations as need be desired. They can be so thoroughly learned in a short time that they can be read with equal, and even greater rapidity than common long-hand, and their use saves more than half the average labor of long-hand.

There are, however, many reasons why a jump from long to short-hand, for business use, cannot be tolerated. All sound reforms necessarily are of slow growth. It nevertheless seems to us possible to hasten the ultimate abandonment of our present clumsy system for short-hand, by requiring that the system of penmanship taught in our schools should constantly tend towards simplicity rather than complication. If one hundred years since, a proposition had been made to at once eliminate all the superfluous letters in English orthography struck from our lexicons since that date, the movement would have met with very serious opposition. This has been done gradually and written language is very much improved thereby.

A steady tendency towards reform in chirography would ultimately lead, naturally, towards short-hand, or it could, we think, be made to do so, would some genius like Mr. Graham take into consideration the best manner in which long-hand may be made to gradually approach short-hand.

We have not had time to elaborate any theory by which such a desirable result can be accomplished,but have thought

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enough upon the subject to get a glimpse of possibilities in this direction which an expert might easily develop.

We trust that Mr. Graham, who has done so much for the cause of brief writing in this country, will examine these possibilities, as we are confident such examination will lead his active mind into a new and interesting channel.

RADIATION OF HEAT.

We not long since briefly discussed the communication of heat by convection and conduction, endeavoring to place in a prominent light some popular errors upon these subjects, and mistakes in the construction of steam boilers, refrigerators, etc., resulting from such errors. It will not be amiss to notice the third way by which heat is transmitted, namely, radiation.

The term, radiation, itself indicates the chief peculiarity of this mode of transmission. All the so-called radiant forces, as heat, light, attraction, etc., act from a center outwards, and all other things being equal, they act equally *in all directions*, the straight diverging lines in which they act being called rays. It must be borne in mind here, that the word center, as used above, is not employed in its strict mathematical sense, but rather means the source from which the heat or light is derived, as these modes of motion may often be generated wholly upon the surfaces of bodies.

Although, to explain the radiation of heat and light through apparently absolute space, a medium called "ether" has been supposed to exist, and although this hypothesis most admirably accounts for the principal phenomena of radiation, and changes in the direction of radiation by refraction and reflection, and though this fact gives such an hypothesis a strong claim to the very general acceptance it has received, still we must remember that it is not a demonstrated fact.

It is not, however, necessary to our present purpose to dwell upon this point, as we wish only to notice some of the most leading facts of radiation, considered in their practical application to the arts, and some facts which have been recently discovered.

A common error is the idea that "heat rises." We have already alluded several times to this error, and shown its fallacy, and we will not dwell upon it now. Suffice it to say that only when the source of heat is placed in a circulating medium, does heat even *appear* to rise.

A heated body, placed within a space void of any liquid or gaseous medium, will radiate heat *in all directions*, the intensity of the heat at any point being to the intensity of the heat at any other point inversely as the squares of the respective distances of the points from the radiating body. This is a fundamental law of radiation, which experiment has demonstrated beyond dispute.

Experiment has also demonstrated that heat radiation is affected by the physical characters of the surfaces of the radiating bodies, and this point is of considerable importance in the arts. Kettles, with smooth polished bottoms, transmit heat to the liquids contained therein much less rapidly than those the bottoms of which are blackened and rough. A steam boiler well lagged, and having the lagging inclosed by polished sheet metal, retains its heat better than by the use of the lagging alone.

Dark colored bodies radiate heat more rapidly than light colored ones. They also absorb heat to a greater extent than light colored and polished bodies. Ice would keep much longer in a bright tin pail than in a dark and roughened one. The polishing of stoves, while it improves their appearance, diminishes their radiating power.

The power of radiation is diminished by hammering and rolling metal. A hammered copper vessel is therefore not as rapid a radiator of heat as a cast one. We have often heard people wonder why copper sauce pans tinned on the interior, are preferred over all others by professional cooks. The reason is that they do not absorb and transmit heat so rapidly as vessels of iron or tin plate. They are hammered out by the coppersmith, who leaves their bottoms quite thick in proportion to the sides. The metal is thus consolidated, and being brightly tinned on the inside, and kept bright externally, the heat cannot pass through them faster than the evaporation of their contained liquids can convey it away. Thus a cook may have twenty different sauces all boiling at once, and yet he has no fear that any of them will scorch. The same reason is doubtless the basis of the favor with which copper is regarded for vessels used in distilling, sugar refining, etc.

All, or nearly all the heat existing upon the surface of the earth, may be properly traced to the radiated heat of the sun. This heat converted into various forms of force, or, according to many modern thinkers, "modes of motion," is reconverted into heat motion again in the combustion of coal, and other chemical reactions, in friction, electric resistance, etc.

Sir John Herschel and M. Pouillet found that, were no heat absorbed by the atmosphere, about 83 foot-pounds per second would fall upon a square foot of surface placed at right angles to the sun's rays. Mr. Meech estimates that the quantity of heat cut off by the atmosphere is equal to about 22 per cent of the total amount received from the sun. M. Pouillet estimates the loss at 24 per cent. Taking the former estimate, 64·74 foot-pounds per second will therefore be the quantity of heat falling on a square foot of the earth's surface when the sun is in the zenith. And were the sun to remain stationary in the zenith for twelve hours, 2,796,768 foot-pounds would fall upon the surface.

The last number of *Silliman's Journal of Science* contains an account of some investigations made by the celebrated Magnus—whose death we recently announced—on heat radiated at low temperatures. It is supposed this was his last work previous to his death.

We will close the present article by transcribing the results he obtained:

"Different bodies at 150° C. radiate different kinds of heat. These kinds of heat are more absorbed by a substance of the same kind, as the radiating body, than by others, and this absorption increases with the thickness of the absorbent.

"There are substances which emit only one or a few kinds of heat, others which emit many kinds.

"To the first of these belong rock salt when quite pure. Just as its ignited vapor, or that of one of its constituents, sodium, radiates but one color, so rock salt, even at a low temperature, emits but one kind of heat. It is monothermic, as its vapor is monochromatic.

"Rock salt even when quite clear, emits, together with its peculiar rock-salt heat, heat which is not more absorbed by a plate of rock salt 80 mm. in thickness, than by one 20 mm. in thickness.

"Rock salt absorbs very powerfully the heat it radiates. It therefore does not, as Melloni supposed, allow all kinds of heat to pass through it with equal facility.

"The great diathermancy of rock salt does not depend upon its less power of absorption, for different kinds of heat, but upon the fact that it radiates only one kind of heat, and consequently absorbs only this one, and that almost all other substances send out heat containing only a small fraction or none of the rays which rock salt emits. But all rays which differ from those radiated by any substance, are not absorbed by it, but pass through with undiminished intensity. From this we may infer that every substance is diathermanous, only because it radiates but few waves of quite definite length, and consequently absorbs only these, allowing all the others to pass through.

"Sylvin (native chloride of potassium) behaves like rock salt, but is not monothermic to the same extent. In the case of this substance also an analogy exists with its ignited vapors, or those of potassium, which, as is well known, yield a nearly continuous spectrum.

"Fluor spar completely absorbs pure rock-salt heat. We ought, therefore to expect that the heat which it emits will be equally absorbed by rock salt. Nevertheless, 70 per cent of this heat can pass through a rock-salt plate 20 mm. in thickness. This may doubtless be easily explained with reference to the quantity of heat which fluor spar emits in comparison with that of the rock salt; still it is possible that fluor spar at 150° emits rays other than those which it absorbs at ordinary temperatures. This behavior is however probably connected with the great reflecting power of fluor spar for rock-salt heat.

"If it were possible to produce a spectrum of the heat radiated at 150° C., the spectrum would, if rock salt were the radiating body, exhibit only one luminous band. If sylvin were used as a radiator, the spectrum would be much more extended, but would still occupy but a small portion of the spectrum which the heat radiated from lamp-black would form."

THE COMMISSIONER SUSPENDS A PATENT AGENT FOR GROSS MISCONDUCT.

Section 17th of the Act approved July 8, 1870, provides, "that for gross misconduct the Commissioner may refuse to recognize any person as a patent agent, either generally or in any particular case; but the reasons for such refusal shall be duly recorded and be subject to the approval of the Secretary of the Interior."

The Commissioner, indeed, has had this power since 1861, but during all that time, so far as we know, the penalty has not been inflicted until now upon any agent practicing before the office. Some complaints, however, have been made against agents for irregularities, and we have reason to know that ex-Commissioner Foote had occasion to regret his leniency in one particular case of a Washington agent, who had violated the confidence of the Office by writing to the clients of another agency during the pendency of the application.

The case brought to the notice of Commissioner Fisher was that of a firm styling themselves "McGill, Grant & Co.," of Washington City, who are charged on seven distinct counts with the crime of misappropriating the moneys of their clients, and in maintaining a false correspondence in relation to the progress of business within the Patent Office.

George W. McGill, senior member of the firm, entered a general plea that the irregularities in the practice as complained of, were the result of having intrusted their Patent Office business to an irresponsible and drunken clerk. The Commissioner, however, refused to accept this answer, inasmuch as all the correspondence of the firm appears to have been carried on in McGill handwriting; and the order of the Commissioner is, "that the said firm of McGill, Grant & Co., as well as the said George W. McGill, be hereafter excluded from practicing before the Patent Office in any and all cases."

McGill has appealed to the Secretary of the Interior to examine his case, and the matter is to undergo further investigation by that official, who directs that the publication of the order be suspended.

THE PRESENT EUROPEAN WAR.

Doubtless all our readers are deeply interested in the great struggle now going on between France and Prussia. While the general discussion of its causes and probable political effect upon European affairs is foreign to the scope of our paper, we cannot refrain from calling attention to an article copied from the New York *Times* of August 17, which is decidedly the best explanation we have yet seen of the causes of the recent disasters to the French army and the success of the Prussians.

In our tour through Prussia in 1867 we were most deeply impressed with the great military strength of the nation. Not only had this kingdom at that time added to the martial spirit of its citizens by a most brilliant military success against Austria, but it was evident that in point of military organization, in the character of her arms, and the *morale* of her troops, she was then, as now, the most formidable military power in Europe.

In a letter published in this journal in August of that year we expressed the belief that the people of Prussia anticipated another war. Whether that surmise was correct or otherwise, certain it is that the event has found them fully prepared for the emergency.

Should the present war result, as now appears likely, in the defeat of France, the first rank in military prowess among the nations of Europe must be accorded to Prussia.

Our readers will find the article to which we have called attention full of instructive interest in this connection. As a fair, candid review of the situation, we commend it to their attention.

THE USE OF TORPEDOES FOR COAST DEFENSE.

It appears that the Prussians, not having a navy equal to the French, have laid a regular network of torpedoes along their Baltic coast, and at the mouths of the rivers Ems, Weser, and Elbe. Both classes of torpedo are said to be in use, the charge being in general dynamite, which, although a dangerous, is a fearfully explosive material. Many of these torpedoes are believed to be mechanical, and, if so, are exceedingly dangerous to both friends and foes. Others are arranged on the ordinary electrical principle, and are perfectly safe except when the electric communications are established. Thus the navigation of the coast, with its rivers and harbors, is quite open to the friendly ship. The merchantman fleeing like the dove from the hawk may safely steer over and among the hidden mines; yet the next moment, by the mere turn of a key, the channel may be effectually closed to the pursuer. The torpedo is the war ship's *bete noir*. The proudest iron-clad that ever floated is powerless against these submerged volcanoes.

Many English sailors remember the Russian torpedoes during the Crimean war. Harmless and insignificant as they were, yet they caused a good deal of trouble; and if they had only been on half or quarter the scale of the present mines, several English ships would be now lying in Baltic mud. We shall not be the least surprised, therefore, some morning to hear of the sudden disappearance of a nautical belligerent.

DEATH OF PROFESSOR PALMSTEDT.

The death of this distinguished chemist, the friend and cotemporary of Berzelius, occured at Stockholm, on the 6th of April, 1870, at the advanced age of 85. He devoted his long life to the good of his country. For twenty four years he was director of the polytechnic school at Gothenburg, and was thus enabled to introduce into Sweden the inventions and improvements of other countries. Technology and agriculture were his chief studies. He was the leading spirit in the organization of new schools and public exhibitions, and at the time of his death was actively engaged on a committee for the arrangement of a permanent exhibition of the products of Swedish industry, in Berlin. He made numerous journeys into foreign countries, the results of which have been published in Sweden—and among his papers have been found an extensive correspondence with nearly every chemist of note of the present century; among his letters, are 268 from Berzelius, which will be published by his executors, and doubtless throw much light on the history of chemistry.

He was a true patriot, an unselfish scholar, a useful man, and his death will be severly felt in Sweden.

SCIENTIFIC INTELLIGENCE.

TETRABROMIDE OF CARBON.

Messrs. Bolas and Groves have succeeded in preparing the tetrabromide of carbon for the first time, by heating together in a sealed tube, at a temperature of 150° C. (302° F.), for about 48 hours, two parts of bisulphide of carbon, fourteen parts dry bromine, and three parts iodine, and subsequently distilling the product off of a caustic soda solution, dissolving in hot spirits, and allowing to crystallize.

The tetrabromide of carbon is a white solid, crystallizing in lustrous plates, and melting at 195° F. It has an ethereal odor, somewhat resembling that of tetrachloride of carbon, and a sweetish taste—nearly insoluble in water, but easily dissolved in ether, bisulphide of carbon, tetrachloride of carbon, chloroform, bromoform, benzole, petroleum, and hot alcohol. It is not particularly acted upon by aqueous solutions of caustic soda and potash, or cold sulphuric acid, and with care can be sublimed unchanged. The authors have not had time to investigate the action of this interesting compound upon silver salts, ammonia, nor its physiological relations. It may prove to be a valuable salt in photography, as well as in medicine, and hence we have given a full notice of it.

ACTION OF SULPHURETED HYDROGEN ON THE SYSTEM.

Max Schaffner has recently made some observations on the action of sulphureted hydrogen that are worthy of publication, as the facts are not generally known.

When a workman remains for days or weeks in an atmosphere containing a very small quantity of sulphureted hydrogen, the symptoms are loss of appetite and headache. The sudden respiration of a large quantity of the gas produces immediate insensibility, as if the person had been shot by a bullet, all the muscles become rigid and motionless, the eyes are staring, and the lungs give out a rustling sound. Brought into the open air, and the head washed with cold water, the patient revives in a few minutes, and complains of lassitude, but not of any pain. Too long delay in such an atmosphere

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would be certain death, and probably a painless one. In one instance a workman who had been rendered insensible by the gas, on his recovery had his combativeness so much aroused that he attacked the bystanders, and was with difficulty kept in bounds. The action of the gas upon the eyes is to inflame them; they become red and swollen, and finally closed, with severe pain. As a remedy, a wash composed of one third of a grain of corrosive sublimate in three ounces of water, was applied.

A mixture of air and sulphureted hydrogen is remarkably explosive. A wire heated red hot and allowed to cool until its color is dark, is sufficiently hot to occasion the explosion of the mixture. The presence of a small quantity of water vapor will prevent the ignition of the gases. Great care should be observed in factories where sulphureted hydrogen is likely to be produced, as its action is subtile, and liable to occasion unexpected explosions as well as loss of life from its poisonous effects upon the system.

PREPARATION OF OXYGEN GAS.

Robbins' method for the preparation of oxygen gas without the aid of heat, has been modified by Böttger, and is represented as affording a pure gas as readily as hydrogen can be made from zinc and dilute sulphuric acid. He takes equal weights of peroxide of lead and binoxide of barium, in a tubulated retort or flask, provided with a safety tube, and pours on weak nitric acid (9° B.); the evolution of oxygen takes place regularly, and the reaction is explained as follows: Binoxide of hydrogen is first formed, and this is at once decomposed by the peroxide of lead, and pure oxygen is liberated. The mixture of the dry lead and barium salt will keep in a well stoppered bottle, and thus the necessary reagents for the evolution of oxygen can be always on hand.

DU MOTAY'S METHOD OF PRODUCING HYDROGEN.

Dr. C. Widemann gives in the *Journal of Applied Chemistry* the latest and most economical method for the manufacture of hydrogen gas on a large scale, invented by Tessie du Motay, and explains why the old way of decomposing steam by live coals cannot succeed. The reason why water cannot be burned as a fuel with any economy is stated as follows: "First, because in the generation of steam a great quantity of latent heat is absorbed; second, because the vapor produced at temperature of 100° C., requires a considerable quantity of free heat, in order to raise it to the temperature at which it will be decomposed, and this heat must either be taken from a special apparatus for super-heating, or it must be furnished by the incandescent coal which it ought to decompose; third, because the retorts containing the carbon which decomposes the water, when brought to a red heat, and exposed directly to the steam, soon become damaged and unfit for use."

He might have added that in most cases the iron of the fire box or grates, or the nozzel of the blower is what is burned up in the production of hydrogen in this way.

Du Motay overcomes all of these difficulties in a very ingenious manner. He discovered that the hydrates of soda, potash, strontia, baryta, or lime, when mixed with charcoal, coke, anthracite, pit coal, peat, etc., and heated to redness, are decomposed into carbonic acid and hydrogen, "without further loss of heat than that due to the production of the carbonic acid and hydrogen."

The hydrates can be used indefinitely, provided they be moistened and regenerated after each operation. No special apparatus for the generation of steam is necessary, and the retorts are less liable to attack. The operation is analogous to the manufacture of carbureted hydrogen by the distillation of coal.

The invention is scarcely inferior in importance to the discovery by the same chemist of a cheap method for the manufacture of oxygen, and if the two processes can be combined, we are in a fair way of obtaining oxyhydrogen gases for metallurgical and other purposes.

With such a source of heat as this constantly at hand, the manner of reducing all metals from their ores will be revolutionized, and many metals which are now with difficulty worked, will at once become available.

IODINE FROM CHILI SALTPETER.

Professor Wagner, in his reports, says that the manufacture of iodine from Chili saltpeter already amounts to 30,000 lbs. per annum. The method invented by Thiercelin for its reclamation from the crude material is as follows: The mother liquors resulting from the manufacture of saltpeter are treated with a mixture of sulphurous acid and sulphite of soda, in proper proportion, and the iodine will be precipitated as a black powder. The precipitated iodine is put into earthen jars on the bottom of which are layers of quartz sand, fine at the top, and coarse at the bottom; from this it is removed by earthen spoons into boxes lined with gypsum, and a greater part of the water thus removed. It is sometimes sold in this impure state, or further purified by sublimation.

The Great Fire in the Woods near Ottawa.

As we are preparing for the press we receive news that the great fire in the woods near Ottawa, Canada, has completely surrounded and now seriously menaces the city. Much property has been destroyed, and quite a number of lives have been lost. North of the city, one and one half miles from the suburbs of Hull, containing all the saw mills and a vast quantity of sawed lumber, the flames are distinctly visible. If the fire reaches the lumber at Hull nothing, it is thought, can save Ottawa from destruction.

MECHANICAL MOVEMENTS.—We are in receipt of a large number of solutions to mechanical problems, published on page 71, present volume. These will all receive due attention at our earliest convenience.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

This learned body commenced its annual session at Troy, N. Y., on the 17th of August.

The Vice President took the chair, and in response to the address of welcome delivered by the Hon. John A. Griswold, thanked that gentleman for his generous recognition of the association, and took the opportunity to review briefly the work of the society, tracing its first incipient beginning in 1840, when it took being in the study of geology and natural history. In 1848 it was reorganized on a broader basis, and the mathematical sciences were comprehended in its investigations. During the four years of the rebellion no sessions were held, but in 1866 it was reorganized at Buffalo, and has achieved most important results since that time. The association to-day misses some of its most honored members. Silliman, Hare, the Rogers, Bache, Hitchcock, and Emmons are no more. Sickness holds others in bonds. Prof. Agassiz, though well enough to take the mountain air, is not yet strong enough to be with us, and Prof. Dana is too feeble to come. Prof. Henry is in Europe, and thus we lose some of our strong men. But we have strength left. There are young men here who are an honor to the cause. It must be clearly understood that this association is not a close body, designed only for the select few; it is more democratic: it enrolls all who take an interest in science, and assures all a candid hearing, no matter what his creed or country. This is the fourth time we have met in this great State, and it is proper that this Empire State should be considered by the representation of American science. It was the first State in the Union to organize a complete system of geological and natural history surveys of its territory, and is therefore classic ground for the student of those sciences. To Troy we look with interest for the success of our meeting, on account of the Rensselaer Polytechnic School—the pioneer of the kind in America—and which, having seen half a century of prosperity, is now more active than ever. To the chemist end metallurgist the extensive iron works here offer great fields for special study, such as few others in the world can equal. Here applications of science render the conversion of ore an ascertained art, and no longer a venture of empiricism. Here also are those famous Bessemer steel works, of whose wonders we have all read, and whose importance is not limited to the production of steel, but, studied by the aid of the spectroscope, throws new light on the chemical and physical constitution of the sun and the furthest nebulæ. These things are mentioned to show that the practical is dealt with by this association.

The work of organization was then resumed, and the following committee appointed: Prof. John Tarry, Prof. E. D. Cope, A. Gray, E. N. Horsford, Prof. Hillyard, and Prof. Winchell. These are on special business before the convention, and all gentlemen of great scholarship, more than half of them presiding over most important colleges.

The Convention then divided into sections, as follows: A, Mathematics and Physical Sciences; and B, Geology and Natural History; each meeting at different places for discussion and business. Section B completed its organization before adjournment, by electing as chairman Prof. Asa Gray; Secretary, Prof. Hartshorn; Sectional Committee, Profs. Hall, Morris, and Hyatt; Committee to unite with Common Nominations, Profs. Dale, Moses, Dalrymple, and White.

Among the papers read on the 18th, and up to the time of our going to press, the only ones of much popular interest, are one on the Isothermals of the Lake Region, by Prof. Winchell, and Notes on the Condors and Humming Birds of the Equatorial Andes, by Prof. Orton.

The paper read by Prof. Winchell provoked earnest debate. The paper embodied the results of careful and prolonged observation at various localities in the region west of the great lakes as far as Nebraska. The Professor used in the illustration of the subject nine isothermal charts for several of the summer months, and winter, autumn ,and spring year mean minima and extreme minima. The professor indicated the wonderful changes in temperature caused by the great lakes in the contiguous country. The cooling influence, science attests, is exerted chiefly on the west side of Lake Michigan and the warm on the east, which depends again on the prevailing winds in summer along the shores of the lake from the east of the meridian in summer, and west of it in winter. In July, for example, the cooling influence on Lake Michigan deflects the isothermal 140 miles, while to the west of the lake they are deflected 400 miles. In January, the mean temperature on the east side of the lake is from four to six degrees higher than on the west side. The isothermals for spring show a marked cooling influence exerted on the west side, and those for the autumn a warming influence on the east side, the joint effect of which is to render the growing season six to thirteen days longer on the east side than on the west side of the lake. The most marked effect and the most surprising is felt in times of *extreme* weather, especially if cold. The isotherm of mean and extreme minima run almost literally north and south along the shore of Lake Michigan. The most excessive cold at Mackinac for a period of 28 years is not on the average greater than at Fort Riley, in Kansas, 480 miles further south. At Chicago it was one degree less than for eleven years. The isothermals for the year might be expected to show no resultant of lake influences. On the contrary, it demonstrates wonderfully the wavering influences excited on the east side; this because the liquid temperature is above that of the contiguous land. Several causes account for the increased heat of the water. The great depth of the lake (900 feet) is sufficient to secure 18 degrees of increased temperature from the earth's heated interior. This, diffused through the waters of the lake, would result in an equal and average elevation of temperature sufficient to cause the phenomena witnessed in the temperature.

In his paper, entitled "Notes on the Condors and Humming Birds of the Equatorial Andes," by Prof. James Orton, of Vassar College, said no bird has suffered more from the hands of the curious and scientific than the condor. Exaggerated stories of its size and strength continue to be published in our text-books, as, for example, that it carries off children, and that the expanse of its wings is from 15 to 20 feet, whereas it is not capable of lifting from the ground over a dozen pounds, and it is doubtful if any specimen ever measured 12 feet. Neither Humboldt nor Darwin found one over 9 feet, but an old male in the Zoological Garden, of London, measures 11 feet.

Whether this greatest of unclean birds is generically distinct from the other great vultures is yet a question among ornithologists, some including in the genus *Sarco ramphus*, the California and King vultures. My own observations of the structure and habits of the condor incline me to say it should stand alone. It is also very certain that, contrary to the usual supposition, there are *two* species of condor on the Andes. The brown kind has been considered the young of the royal black; but it is evidently distinct. The reasons for this belief were given in detail by Prof. Orton.

The largest condors are found about the Volcano of Cayambi, near Quito, and most commonly around vertical cliffs. It is often seen singly soaring at a great hight in vast circles. It never flaps its wings except in rising from the ground. Humboldt saw one fly over Chimborazi; I have seen them sailing at least 1,000 feet above the crater of Pichincha. It a marvelous eater. I have known a condor of moderate size to devour in one week a calf, a sheep, and a dog. It will eat everything but pork and cooked meat. The only noise it makes is a hiss like that of a goose. Incubation occupies about fifty days, ending in April. The young cannot fly till they are over a year old, for up to that time they are as downy goslings. While moulting, they are fed by their companions, moulting time not being uniform. There is a singular difference between the sexes, the eyes of the male being light brown and in the female bright red. The females are also smaller in size, and want the crest and wattle. The toes are less prehensile than those of other Raptores. Professor Orton also gave some new facts respecting the Hummers of the Andes as the result of his own observations. The group *Polytminæ* comprises nine tenths of known species. Their headquarters seem to be New Granada. Many of them are restricted to very narrow localities. Of the 430 species known, 84 are found in Ecuador. If the wanton destruction of specimens for decorative purposes continues, several genera will soon be exterminated.

Nidification is uniform at the same altitude and latitude. In the valley of Quito it occurs in April. The nest is built in six days. Some are cup-shaped; others hang like a hammock by spiders' webs, while the long-tailed species constructs a purse-shaped net. Prof. Orton here exhibited several specimens to show how strikingly the nests of the Andean species differ from those of our own hummer—the latter being covered with lichens, and the former invariably with moss. The usual number of eggs laid is two, and these are of a pinkish hue. Incubation lasts twelve days at Quito, and there is but one brood a year, though two in Brazil.

Models for the Patent Office.

Under the new law the Commissioner may, at his discretion, dispense with models when application is made for a patent, but he does not propose to relinquish the requirement except in cases where the invention can be clearly understood without a model. In dealing with our clients we shall be very careful to advise them when we think a model may be dispensed with. Examiners as a rule are opposed to doing away with models, and the case must necessarily be a clear one before they will consent to act without them.

ALASKA FURS.—Notice has been received at the Treasury Department of the arrival of the steamer *Alexander* at San Francisco, from Alaska, freighted with the seal fur product of 1869. She brought 60,992 skins taken on the island of St. Paul, and 24,909 skins taken on the island of St. George, making a total of 85,901 skins, upon which the owners are required to pay a tax to the United States of one dollar upon each skin. The same vessel brought 1,688 fox skins from the same islands, but as the law imposes no tax upon these the question has been submitted to the Treasury officials as to allowing them free of duty.

THE CHASSEPOT AND THE NEEDLE-GUN.—A private letter from an Englishman, dated "Saarbrücken, says: I can't help reiterating that in all the shooting there has yet been the Prussians have had out and out the best of it. Nothing could be worse than the Chassepot at short ranges. We see the Frenchmen spitting on their cartridges, sticking their fingers into their guns, and giving every possible sign that, after a few shots, the Chassepot gets so foul they don't know how to treat it."

CLOGGING OF BOLTING CLOTHS.—Messrs. Glen & Wright, of Atlanta, Ga., referring to a letter from a correspondent complaining of the clogging of bolting cloths, state that the Godfrey Patent Flour Cooler Bolt and Cleaner meets every exigency of the case.

INVENTORS who desire to know in advance respecting the novelty of their inventions, can have a careful preliminary examination made at the Patent Office for a fee of $5. Address (inclosing sketch and description) the publishers of this journal.

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The Infection of Rivers by Manufactories.

The continual discharge of the waste of manufacture into adjacent rivers, and consequent impurity of the water, its unfitness for domestic purposes, and its danger to hygiene, have been the subject of an investigation by an English commission, by which some interesting and important facts were brought out.

The little river of Irwel, which flows through Lancashire, is as clear and limpid as a crystal at its source. Two miles and a half from where it rises is Bacup. Before it reaches the latter place, it has already taken up the impurities of nineteen cotton mills, two dye-houses, a printing establishment, one saw and two flour mills. Now Bacup adds to its impurities, and immediately below it follow thirty cotton and woolen factories, six gum factories, tan yards, print works, clay works, saw mills, a porcelain and gas factory. No wonder that at Ramsbottom the river is "infected and black as Styx." At Manchester, however, the Irwel reaches nearly the maximum of impurity, holding 58·8 per cent of solid matter in suspension, and 9·43 per cent of chloride in solution. It has at that point received the waste of *ten thousand* different manufacturing establishments, besides the impurities of the cities and villages on its banks. "In view of such facts," says the report, "we have only one feeling and one word by which to express it—it is hideous." Of course this is one of the worst instances; but there are certainly many which are not much better.

From the conclusions of the English committee, we extract the following: Heretofore, it was believed that the sewage emptied into a river was oxidized at the expense of the oxygen inclosed in the water, and finally disappeared entirely. This would be a very convenient method of purification. Something similar was supposed to take place, as in the case where dirty water is poured on cultivated land, and filters through the soil. After this filtering it is free from impurities; the organic matter has been transformed into carbonic acid; but unfortunately, this theory does not hold true; a mass of impurity is not destroyed in running water, and we must cherish no illusions in this respect. There is only one effective method of meeting the danger; the sewage and waste, before being emptied into a river, must be subjected to a filtration which deprives them of their noxious germs and impurities; it is sufficient to pass them through some porous substance which retains the solid matter, and oxidizes the soluble substances.

The commission has, moreover, established the fact that the irrigation of a large extent of land with sewage water is not attended with any danger to the public health; after a few days the disinfection is complete. The conclusions of the English commission coincide entirely with the results obtained in France by experiments made near Asineres and Clichy, and may be taken as the basis of any regulations which, in due time it may become necessary to adopt in our own crowded manufacturing districts, for the preservation of the purity of our rivers.—*Manufacturers' Review.*

Errors in the Treatment of the Horse.

In the midst of change, improvement, reform, says the Philadelphia *Ledger* quite a number of questionable old notions continue to be followed, even now when the very erroneous character of some of them has been acknowledged. Of this character is the rigid adherence of a majority of drivers of horses to that useless and injurious relic of old times, the check-rein. Its use with draft horses is positively cruel. When a horse is drawing a heavy load, and particularly "up hill," he needs the utmost freedom of lungs and wind, and this he can never have with a tight check-rein. That the check rein prevents a horse from stumbling is more than doubtful; on the contrary, by elevating his eyes, it prevents him from seeing clearly where to place his foot. When a horse does stumble, he is far less likely to go down when his head is left free.

In England, where they are far ahead of us in everything pertaining to horses, the check-rein has been abolished; the last surrender being that of the artillery and commissariat trains of the British army, the change having been made by Sir George Burgoyne, the Commander-in-Chief, and he testifies to the beneficial effects attending it.

In New York city, thanks to Mr. Bergh, many of the finest equipages are driven without the check-rein, and a few humane people have thrown it out of use here. The old-fashioned "blinkers," or blind-halters, are also useless, if not positely injurious, by coming in contact and rubbing the lids of the horse's eyes; and many experienced horsemen long ago came to the conclusion that horses are more easily alarmed by what they hear and do not see, because, being intelligent animals, if they can fully see the objects, which when unseen or imperfectly seen, tend to frighten them, they are more readily calmed.

Another popular error, which bears hard on the horse, is the custom of making the axles of conveyances of all sorts of one uniform width. This custom is of ancient date, and it has caused great detriment to our public highways, both in town and country. It is not, perhaps, saying too much to assert that the uniform adherence to it has caused our Highway Department for the last fifty years hundreds of thousands of dollars. Had there been a latitude or play of from ten to twelve or fourteen inches in the tread of the wheels, especially in carts and wagons, it would have been impossible to have cut our pavements into the ruts we now see, and which renders hauling so difficult along our streets and roads. Like the Connestoga wagons of the last generation, with their broad tires, a difference in the width of our anxles would have improved rather than damaged our highways, and we should not see them cut into alternating ridges and ruts, as so many of them are now

HOW TO UTILIZE A HEN ROOST.—A genius by the name of Jeremiah Cory, of Holden, Mo., has recently taken out a very novel patent. The invention consists in so combining and arranging a poultry roost with the gates of one or more beehives that the perching of the poultry upon the roost will serve to automatically close the hives. The object is to insure the closing of the hives at night, so as to exclude the bee-moth, and the opening of the same in the morning to permit the passage of the bees in and out during the day. The genius of our people is equal to all emergencies.

A CORRECTION.—A letter published in our issue of August 6th, accredits the building of the steamer *Robert E. Lee*, which lately figured in a race upon the Mississippi River, to Louisville, Ky. Mr. A. S. Roger, Jr., of New Albany, Ind., now writes us that this steamer was built at the latter place, he himself having built her cabin.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal.

All reference to back numbers should be by volume and page.

G. B., of Ind.—The following directions for soldering aluminum have been already published in this journal. However, for your benefit, and that of other new subscribers, we will reprint them here: "Mouray, of Paris, employs five different solders, which are composed as follows:

No. 1.	No. 2.	No. 3.	No. 4.	No. 5.			
80	85	88	90	94	parts in weight	of	zinc.
8	6	5	4	2	"	"	copper.
12	9	7	6	4	"	"	aluminum.

"These ingredients are melted in a crucible. The copper is fused first, and the aluminum is then added in three or four portions. When the whole is liquefied, it is stirred with an iron rod. The crucible is then withdrawn, and the zinc introduced into the mass under constant stirring. It should be free from iron. The liquefied mass is poured in ingot-like molds, which have been wiped out with benzine. The selection of the solder depends upon the nature of the object. In order to quicken its fusion on the metal, a mixture of three parts of balsam of copaiba and one part of Venetian turpentine is made use of; otherwise the operation is performed in exactly the same manner as in the brazing of other metals. The aluminum solder is spread without delay on the previously heated surfaces to be fastened together. In heating, the blue gas flame or the turpentine blast lamp is employed. The more and oftener the solder is spread over the surface the better it is."

J. H. S., of ——., asks whether in weighing a load on a wagon, by first driving on to the scale the fore wheels, weighing, and noting the result, then drawing off the fore wheels and drawing on the hind wheels, weighing, and noting the result, then discharging the load, weighing the wagon, and deducting its weight from the sum of the two previous weights, the correct weight of the load would be obtained.—If the wagon were constructed so that the fore and hind wheels sustained equal portions of its weight, and if the load were so placed that the fore and hind wheels sustained equal parts of *its* weight, and if the wheels were exactly level at the time of weighing, and if the half of the combined weight of load and wagon in each of the two first weighings rested upon the scale, the position of the wagon being so adjusted in each weighing that this precision could be secured, the correct weight could be ascertained in the manner specified. The chances that all these adjustments could be made under ordinary circumstances, are not one in a billion.

J. R., of Ohio.—We do not believe application of paint in the extreme heat of July or August, will materially aid the chemical changes, which take place ultimately in all paints which contain lead. Although neat facilitates most chemical reactions, the differences between the temperature of what are usually called hot days, and those called cool, in summer, is scarcely ever more than twenty degrees in the shade. The cracking off, and change of color in the mixture of white lead, red lead, and yellow ocher, of which you speak, is doubtless due to some defect in the vehicle, or adulteration in either or both vehicle and pigments.

H. B. G., of N. J.—We do not believe that wetting down the ashes in the ash-pit of your boiler, to preserve the grate, is so good a practice as to rake them out after slicing the fire, though of course the cooler you keep the pit the longer the grate will last. Wetting down with the hose is a "mussy" operation, and helps to disintegrate the masonry. Cooling the pit in this way will not injure the draft, but we should think it would not be necessary with the depth and size of your ash-pit.

P. P. P., of N. Y.—We do not know of any way to make the mixture of gl and glycerin, used for printer's rollers, water proof. We do not thin there is any way known. None of the chromates or bichromates, or tannin, though acting upon the glue, would, in our opinion, answer for this purpose. If any one knows of any means whereby this can be accomplished, we shall be glad to hear from him.

R. H., of Ohio. The words, belt, band, and strap, are equally appropriate, applied to flexible leather or rubber connectors of pulleys. In this country, belt and band are more commonly used. In English works we frequently meet the word strap used in this way. The word belt is one most in use among American mechanics.

D. L. B., of N. H.—You have, it seems, stumbled upon a well-known fact. If you will take another hardened steel rod, and hold it in the line of the magnetic dip, at your locality, and strike it as before with the hammer, you will develop magnetism in it also, and may count upon the same result, as often as the experiment is repeated.

G. H. M., of Va.—When the attraction and repulsion of the molecules of a mass are in equilibrio, the physical state of the mass is a liquid, and not a solid, as you assume. This error wholly vitiates your conclusions.

J. B., of N. Y.—Your question in regard to the tension of hollow shafts cannot be answered. You appear to be confounding horse power with static pressure.

G. F. M., of Mass.—We think a solid rubber or tanite emery wheel will answer your purpose for surfacing down pieces of plate steel much better than anything else.

H. C. P., of Mich.—We shall publish no more communications upon the subject of inertia at present. The question is one which we think does not generally interest our readers.

Caveats are desirable if an inventor is not fully prepared to apply for a patent. A Caveat affords protection for one year against the issue of a patent to another for the same invention. Patent Office fee on filing a Caveat, $10. Agency charge for preparing and filing the documents from $10 to $12 Address MUNN & CO., 37 Park Row, New York.

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Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th, 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau st., N. Y.

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Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

APPARATUS FOR FORCING WATER.—James M. Rucker, Forrest Depot, Va.—This invention consists in the combination of a subterranean reservoir, so situated that it may receive water from the surrounding earth, with a pipe for introducing air under pressure into the upper part of the reservoir, a pump for supplying such air and putting the requisite pressure upon the same, and with a second pipe for conducting the water forced out the reservoir by the pressure of the introduced air to the spot where it is needed.

HOISTING JACK.—Frank Hollenberry, Frizellburgh, Md.—This invention consists of a stationary upright frame provided with a centrally vertical sliding bar, which is raised and lowered by means of two levers, one of which serves to hold the bar at the hight to which it had been raised, while the other is taking a fresh hold, both levers operating upon the bar through the medium of clamps which bite the bar, one when pressure or weight is applied to the bar and the other when pressure is applied to the lever.

MACHINE FOR CUTTING SLATS FOR WINDOW BLINDS.—John W. Helder, Shannon, Md.—This invention has for its object to cut from a piece of wood of any dimensions a splint or slat of the proper width and thickness, such slat passing off through the stock in the same way that shavings are conducted away in an ordinary plane.

SHEAVE BLOCK.—Thos. H. Rice, Baltimore, Md.—This invention consists of friction rollers, mounted in boxes, which are placed in both the inner sides of a pulley block in such manner that the rollers project inward beyond the surfaces of the sides, so as to prevent the sheaves from coming in contact with the block, and wearing the same away.

TILE-CUTTING MACHINE.—Oscar F. Monfort, Dearborn, Mich.—This invention relates to improvements in machines for cutting the tile as it issues from the tile machine in continuous form into short sections, and consists in the application to the carrying table between two endless belts of a fine wire or steel-plate cutter, stretched between an arm and a shaft, by which the arm is revolved so as to be revolved around the shaft and forced through the tile while moving along, the cutter being arranged to move with the tile, while cutting, and back again after cutting, and the arm which supports the swinging end of the cutter being arranged to pass between the cut sections. The invention also comprises a carrying table, for passing the cut pieces beyond the arm which supports the cutter suspended on the shaft, and held in position by a weight, so that the arm which carries the cutter may pass around it.

RAILROAD SWITCHES.—J. H. Stockton, Thompson, Ga.—This invention relates to improvements in railroad switches, and consists in the application to the switch rails or the bars, for moving them of a weight, and suitable levers or gears, and a holding and tripping lever, so that the tripping bar or lever being moved by the wheel of the advancing locomotive will trip the weight and let it fall to close the switch.

MAINSPRING WINDER.—Michael D. Kelly, Cadiz, Ky.—This invention relates to improvements in tools for winding the mainsprings of watches and inserting them in the barrels, and consists in a pair of bars pivoted together at one end by a compass or rule point, and having a semicircular recess at the free ends for the reception of the spring, to be coiled therein by a winding shaft of any kind, and the said bars are provided with gaging springs to vary the depth of the recesses; also with pins for gaging the recess to receive the spring and for controlling the relation of the winder with the winding shaft. The said bars are also provided with an opening spring and closing screw.

DIAPER PINS.—Isaac W. Stewart, New York city.—This invention relates to improvements in the construction of diaper pins, and consists in an improved mode of constructing the shield and attaching it to the pin.

PRESSES.—G. W. Swinebroad, Bolivar, Tenn.—This invention relates to improvements in hay, cotton, and other presses, and consists in operating the follower by means of levers, links, gripping blocks, and vertical bars, the gripping blocks working on the vertical bars.

WATCHMAKERS' TOOL.—Michael D. Kelly, Cadiz, Ky.—This invention relates to improvements in tools for watchmakers' and repairers' use, for holding the watch plates and other articles, also for holding the tools with which the work is done in all operations now commonly done in a lathe, such as drilling, milling, jewel setting, freeing, gaging, pinion centering, uprighting, and the like. The said improved tool is also applicable for the uses of an anvil.

MACHINE FOR TURNING AXLETREES.—William H. Heffley, Rochester, Ind.—This invention has for its object to construct a machine for turning the ends of axletrees so that the same will correspond exactly with the pindles or thimbles into which they are to be fitted. The invention consists chiefly in providing a mechanism, whereby the inner form of the thimble is exactly transferred to the outer side of the axle, that is to say, a set of levers whose ends are pressed against the inner face of the thimble control the cutters which turn the axle.

TRUSS PADS.—Dr. S. S. Ritter, Philadelphia, Pa.—This invention consists in a new method of manufacturing pads for trusses, whereby the time and expense of the same are materially reduced as compared with that attending the ordinary method.

SPRING WAGON SEAT.—G. W. Diller, Odell, Ill.—The object of this invention is to furnish an improved device for attaching springs of wagon seats to wagon boxes or bodies, whereby the strain upon the springs and box shall be greatly lessened and also other obvious advantages obtained.

FENCE.—William Bartlett, Little Hocking, Ohio.—This invention relates to a zigzag or worm fence, and consists in posts planted at an inclination all leading inward or toward the vertical plane cutting centrally length, wise of the fence for the purpose of rendering the fence firmer than as though the posts were upright.

CORN HUSKER.—S. L. Bligh, Sandy Lake, Pa.—The object of this invention is to construct an instrument by means of which the husking of corn can be accomplished in an easy and expeditious manner.

HAIR TRIGGER ATTACHMENT TO FIRE-ARMS.—Joseph Deutz, San Antonio, Texas.—This invention relates to a new hair trigger attachment which is applicable to fire-arms of all kinds, and of such simple construction that it will be reliable and durable.

BARBER'S FURNITURE.—Otto Stoelker, Montgomery, Ala.—This invention relates to a new apparatus which is to be set up in barber shops with an object of economizing time and labor, and preventing waste of material.

MOLDING CUTTER HEAD.—Darius Stevens, Danbury, Conn.—This invention has for its object to furnish an improved cutter head for holding the cutters for forming moldings, which shall be simple in construction, convenent in use, and will hold the cutters securely.

FAN BLOWER.—John Ericsson, New York city.—This invention relates to a new multiplying fan blower of that class in which a series of wings are rotated between a series of diaphragms for compressing the air by centrifugal force, and utilizing it in the compressed state for suitable purposes. The invention consists chiefly in the use of a rotary case and stationary shaft instead of the rotary shaft and stationary cases heretofore employed. The necessity of constructing the case in sections, so as to enable the introduction of the several wings that are mounted upon the shaft, is thus overcome and the case may be made in one single piece, and consequently much cheaper than the ordinary blower now in use. The amount of rotating surface gained by making the case revolve adds also considerably to the efficiency of the machine.

CAR COUPLING.—J. H. Johnson, Dresden, Mo.—The object of this invention is to provide a coupling for railroad cars whereby the inconvenient links and the necessity of handling the same can be dispensed with. The invention consists in making the coupling boxes or main and saw heads serve the purposes of links, so that those of two cars can be locked together by means of a horizontal coupling pin dropped in from above

LATH SAWING MACHINE.—J. J. Knowlton, Philadelphia, Pa.—This invention relates to a new construction of machine for sawing laths, pickets etc., and consists in the application of vertically adjustable guides, which hold the sawed pieces and prevent them from springing or twisting on the saws. The invention consists also in setting the feed rollers at an angle, *i. e.*, slightly oblique, so that they will crowd the stuff against the stationary guide or fence, and thereby the requisite straight guidance will be obtained.

FENCE POST.—O. L. Larkin, Otto, N. Y.—This invention has for its object to reduce the expense and increase the durability of fence posts, and consists in making the foot or lower part of each post of metal, while the upper part is made of wood to allow the nailing on of planks, etc.

DRAIN AND WATER-PIPE MACHINE.—John W. Stockwell, Portland, Me.—This invention has for its object to furnish a simple and convenient machine for forming drain and water pipes, which shall be so constructed and arranged as to pack the material uniformly throughout the length of the pipe.

GUIDE FOR CIRCULAR SAWS.—Alexander Middlebrook, Glasgow, Mo.—This invention relates to a new guide for circular saws, which is so constructed that the pins can be simultaneously moved in the same direction, without requiring to be directly handled. The hands of attendants will thereby be kept from dangerous contact with the saw.

STEAM GENERATOR.—Joseph A. Miller, New York city.—The object of this invention is to construct a steam generator, which will insure a thorough circulation of the water, to expose the same to all the heating surfaces, and in which the steam will be effectually separated from all water that may arise with it into the upper steam passage. The invention consists in the application to a vertical or inclined water and steam chamber of a series of continuous circulating pipes, of which each enters the chamber with both ends. Each pipe receives water at the lower, and discharges steam at the upper end, and the steam is therefore produced by the circulation of the water through the said pipes.

COFFEE MILL.—F. C. Richer. Gilmer, Texas.—The object of this invention is to simplify the construction of upright coffee grinders, so that the same can be made cheaper and stronger than heretofore. The invention consists in constructing the entire mill of three pieces, the grinder being one, while the case or shell is made of two parts.

HAY LOADER.—William H. Gray, Ashfield, Mass.—This invention relates a new and useful improvement in machines for loading hay, whereby that laborious operation is performed by horse power, and in the most expeditious manner.

SELF-ACTING COMPRESSION FAUCET.—Edward Noble, North Haven, Conn.—This invention relates to a new and useful improvement in faucets, and consists in an arrangement whereby the faucet valve is closed by the pressure of the fluid, and opened by means of a lever and inclined plane.

PORTABLE GAS-PIPE VISE.—Thomas Marshall, Paterson, N. J.—This invention has for its object to furnish an improved portable vise for holding gas pipes, while being cut off, or having screw threads cut upon their ends, and which shall be so constructed that the workman can conveniently carry it in his bag, and which may be readily attached to a bench, table, or other support.

VINE CUTTER OR TRIMMER.—H. W. White, Joppa Village, Mass.—This invention has for its object to furnish an improved implement for cutting or trimming the runners from strawberry vines, planted in hills, which shall be so constructed as to cut off all the runners from the hill at a single operation, and which shall at the same time be simple in construction, effective in operation, and conveniently operated.

SLIDE CHUCK FOR LATHES.—C. F. Stackpole, Woburn, Mass.—This invention has for its object to furnish an improved slide chuck for lathes, designed more particularly for holding cranks while being turned, but equally applicable for holding other work, and which shall be simple in construction, and easily adjusted.

SEPARATOR ATTACHMENT FOR THRASHING MACHINES.—Moses A. Keller, Littlestown, Pa.—This invention relates to improvements in grain separating and winnowing apparatus, and consists in a straw carrier, composed of long bars, carrying teeth and short bars, mounted near each end to crank shafts, which move them up and down, and forward and back, over an ascending table, composed of transverse slats or bars with spaces between, made adjustable to vary the spaces, which let the grain and chaff through to an endless carrier, which takes it up to the hopper of the winnower, arranged under the case of the carrier. The said case and the case containing the straw-carrying attachment, are made in two parts, and arranged for detaching the carrying apparatus to use the winnower alone. The invention also comprises a regulating apparatus for the winnower, to open or close the air passages, and a straw-carrying attachment. It also comprises certain improvements in driving gear for working a secondary straw carrier.

AXLE GAGE.—Rollin C. Kelly, Brandon, Wis.—This invention relates to a new and useful improvement in apparatus for obtaining the true bevel for the arms of the axles of wheeled vehicles.

STEAM BOILER.—D. A. Morris, New York city.—This invention relates to new and important improvements in steam boilers, whereby they are made much more safe, durable, and effective than boilers of ordinary construction.

MACHINE FOR MAKING MATCH SPLINTS.—Denslow Burhaus, Burlington, Iowa.—This invention relates to a new and useful improvement in machines for making splints for lucifer matches, whereby that operation is greatly facilitated.

POUNCING MACHINE.—John Rosenkranz, Boston, Mass.—This invention relates to a new and useful improvement for machines for pouncing hats whereby the labor is greatly lessened and the operation is performed in the most thorough and expeditious manner.

BEDSTEAD FASTENING.—P. Maulding and John U. Fraley, Marshall, Texas.—This invention relates to a new and useful improvement in mode of fastening the rails to the posts of bedsteads, whereby many of the objections to the ordinary bedstead fastening are obviated.

TURNING AND SCREW-CUTTING LATHES.—Philip H. Pitts, Waverly, Mo.—This invention relates to improvements in turning and screw-cutting lathes, and consists in a lathe so arranged that, by shifting some of the parts, it may be readily adjusted either for turning or cutting screw threads on bolts.

STEAM PUMPING ENGINE.—Thomas E. Blunt, Brookfield, Ohio.—This invention relates to a new and useful improvement in steam steam pumping engines, and consists in exhausting the steam from the engines into the discharge pipe of the pump, thereby making a condenser of the discharge, and materially increasing the efficiency of the engine.

SLIDING DOOR FOR STREET CARS.—Daniel R. Hart, St. Louis, Mo.—This invention has for its object to furnish an improved sliding door for that class of street cars known as the fare-box car, and which has heretofore been made with a swinging door and covered step, so to render said cars more convenient in use, both for driver and passengers.

SPRING BED BOTTOM.—Chas. T. Baade, Brooklyn, N. Y.—This invention relates to improvements in the construction and arrangement of spring-bed bottoms in which long wood slats or springs are used in combination for the head and center of the bottom, the foot ends of the wood springs being arranged to rest on a wood bolster or cross-piece of the frame, and the head ends being bent and suitably shaped to be used in substitution to the stuffed bolsters sometimes used.

DITCHING PLOW.—S. S. Wood, Brooklyn, N. Y.—This invention relates to new and useful improvements in plows for cutting ditches for laying drain tile, draining off water, or other purposes, and consists, firstly, in a device for adjusting the beam vertically, so that the pitch of the plow may be varied as it descends in the process of cutting the ditch; and, secondly, in an adjustable branch handle, on the standard handle, by means of which the attendant is enabled to guide and control the plow, as it descends, while walking on the surface of the ground.

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106,302.—LAMP BURNER. — Benjamin F. Adams, Boston Mass.
106,303.—LAMP BURNER. — Benjamin Franklin Adams Boston, Mass.
106,304.—EQUALIZING THE MAINSPRING OF TIME-PIECES.—J P. Adams, Ipswich, Mass.
106,305.—CUTTING APPARATUS FOR HARVESTERS.—Henry C Aydelott, Carthage, Ind.
106,306.—HARNESS-OPERATING MECHANISM FOR LOOMS.—John Ashworth, North Andover, Mass.
106,307.—SEWING MACHINE.—M. M. Barnes, North Adams, Mass.
106,308.—STONE-SAWING MACHINE.—Charles Bateman, Baltimore, Md.
106,309.—TOP PLATE OF COOKING STOVE.—Milton Bennet, Dayton, Ohio.
106,310.—CHISEL FOR CUTTING GAINS.—Hiram Bigelow, Skowhegan, Me.
106,311.—HAND CORN HUSKER.—S. L. Bligh, Sandy Lake, Pa.
106,312.—STEAM PUMPING ENGINE.—T. E. Blunt, Brookfield, Ohio.
106,313.—COMPOUND FOR FERTILIZER.—Gustave Bourgate, New York city.
106,314.—FOOT MEASURE.—John C. F. Bremser, St. Louis, Mo.
106,315.—HINGE.—J. D. Brown, Madisonville, Ohio.
106,316.—SPRING BED BOTTOM.—C. T. Baade, Brooklyn, N. Y.
106,317.—DEVICE FOR LEVELING BILLIARD AND OTHER TABLES, ETC.—B, W. Bull, New York city.
106,318.—TABLE.—Ernst Brucker, Old Tappan, N. J.
106,319.—MACHINE FOR MAKING MATCH SPLINTS.—Denslow Burhaus, Burlington, Iowa.
106,320.—COMBINED DRILL AND SEEDING MACHINE.—J. E. Buxton, Owattonna, Minn. Antedated July 2, 1870.
106,321.—PADDING FOR HARNESS.—James Cormac and Alex Stobbs, Hector, N. Y.
106,322.—MANUFACTURE OF RESIN SOAP.—D. B. Chapman, New London. Conn.
106,323.—TABLE KNIFE.—Matthew Chapman, Greenfield, Mass.
106,324.—PROTECTING SAFES AND VAULTS FROM BURGLARS.—C. T. Chester, Englewood, N. J.
106,325.—POST-OFFICE CABINET FOR SUNDAY-SCHOOL AND OTHER ROOMS.—Wm. M. Clark and Alexander Clark, Pittsburgh, Pa.
106,326.—WELL BUCKET.—Alvens J. Clemens, Aberdeen, Miss.
106,327.—ROOFING FELT.—W. B. Coates (assignor for one half his right to Joseph Leeds), Philadelphia, Pa. Antedated August 4, 1870.
106,328.—GARTER.—Charles Coester, Jr., and Jas. L. Moore, Bridgeport, Conn.
106,329.—STRAW CUTTER. — Samuel Colahan, Cleveland, Ohio.
106,330.—APPROACH GATE.—S. H. Cole, East Enterprise, Ind.
106,331.—PADDLE WHEEL.—R. H. Connelly, Philadelphia, Pa.
106,332.—STRETCHER FOR PICTURE FRAME.—J. D. Crocker, Norwich, Conn.
106,333.—COMPOUND FOR CURE OF COUGHS, ETC.—John Cushions, Wellington, Ohio.
106,334.—LOOM.—H. D. Davis, North Andover, Mass.
106,335.—SHEAVE.—H. D. Davis, North Andover, Mass.
106,336.—HORSE HAY RAKE.—S. L. Denney, Christiana, Pa. Antedated August 5, 1870.
106,337.—GUN LOCK.—Joseph Deutz, San Antonio, Texas.
106,338.—SPRING SEAT FOR VEHICLES.—G. W. Diller, Odell Ill.
106,339.—PITMAN CONNECTION FOR HARVESTERS.—Joseph Dixon and M. B. Sampson, Eddyville, Iowa.
106,340.—EXTENSION TABLE SLIDE.—William Donoghue, Philadelphia, Pa.
106,341.—HAME FOR HARNESS.—Wm. Duncan, Spring Hill, Ind.
106,342.—HARVESTER RAKE.—Wm. T. Eastes, Summitville, Ind.
106,343.—INVALID CHAIR AND LOUNGE.—William T. Eastes Summitville, Ind.
106,344.—PLOW.—Isaac Eastwood, Lanark, Ill.
106,345.—RECORDING PRESSURE GAGE.—Jarvis B. Edson, Brooklyn, N. Y.
106,346.—INDIA-RUBBER SHOE. — Lewis Elliott, Jr., and George H. Fowler (assignors to L. Candee & Company), New Haven Conn.
106,347.—MANUFACTURE OF WROUGHT AND PUDDLED IRON.—William Ennis, Philadelphia, Pa.
106,348.—FAN BLOWER.—John Ericsson, New York city.
106,349.—BENCH VISE.—G. M. Evans, Pittsburgh, Pa.
106,350.—RAISIN SEEDER.—H. G. Fiske (assignor to Geo. L Taylor and Dwight Holland), Springfield, Mass.
106,351.—HINGE.—Charles Gaylord, Washington, D. C.
106,352.—OVEN.—D. J. George, Arcade, Ind.
106,353.—TABLE-LEAF SUPPORTER.—George L. Gerard, New Haven, Conn.
106,354.—CULTIVATOR.—John L. Graham, Bentley Station, Ill.
106,355.—HAY LOADER.—W. H. Gray, Ashfield, Mass.
106,356.—BUCKLE WITH BUTTON-HOLE ATTACHMENT.—B. J Greely, Boston, Mass.
106,357.—APPARATUS FOR RAKING AND BINDING GRAIN.—T. K. Griffith, Redstone, Pa. Antedated August 4, 1870.
106,358.—STEERING APPARATUS.—Charles Godfrey Gumpel, No. 49 Leicester Square, London, England. Patented in England Nov 2, 1869.
106,359.—MACHINE FOR PREPARING APPLES FOR THE MANUFACTURE OF CIDER.—G. B. Hamblin, Willimantic, Conn.
106,360.—GEARING AND SELF-ADJUSTING SHAFT.—George B. Hamlin, Willimantic. Conn.
106,361.—WHEEL HUB.—J. B. Hards, Chicago, Ill.
106,362.—DOOR FOR STREET CARS.—Daniel R. Hart, St. Louis Mo.
106,363.—LAMP BURNER.—H. W. Hayden (assignor to Holmes, Booth & Haydens), Waterbury, Conn.
106,364.—MACHINE FOR TURNING AXLE TREES.—William H. Heffley (assignor to himself and David Barb), Rochester, Ind.
106,365.—MANUFACTURE OF IRON AND STEEL.—James Henderson, New York city

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106,366.—MANUFACTURE OF BOOT AND SHOE SOLES.—Eugene Ibos. Paris, France.
106,367.—RAILWAY CAR COUPLING.—J. H. Johnson, Dresden, Mo.
106,368.—KEY HOLE GUARD.—J. H. Jones, Binghamton, N. Y.
106,369.—EGG CARRIER.—E. E. Joseff, St. Louis, Mo.
106,370.—SEPARATOR ATTACHMENT TO THRASHING MACHINES.—M. A. Keller, Littlestown, Pa.
106,371.—WATCH MAKING TOOL.—M. D. Kelly, Cadiz, Ky.
106,372.—DEVICE FOR WINDING MAINSPRINGS OF WATCHES. M. D. Kelly, Cadiz, Ky.
106,373.—AXLE GAGE.—R. C. Kelly, Brandon, Wis.
106,374.—LATH MACHINE.—J. J. Knowlton (assignor to himself and W. H. Burr), Philadelphia, Pa.
106,375.—FENCE POST.—O. L. Larkin, Otto, N. Y.
106,376.—HARROW AND CULTIVATOR.—John Lerch, Uhlersville, Pa.
106,377.—BEE HIVE.—Volney Leonard, Springfield, Pa.
106,378.—RAILWAY CARRIAGE.—A. R. Locke, Boston, Mass.
106,379.—CARRIAGE JACK.—David Marshall, Northville, Mich.
106,380.—PORTABLE GAS-PIPE VISE.—Thomas Marshall, Paterson, N. J.
106,381.—CORSET SPRING.—F. W. Marston, Philadelphia, Pa.
106,382.—BEDSTEAD FASTENING.—Pres. Maulding and J. U. Fraley, Marshall, Texas.
106,383.—GALVANIC BATTERY.—E. D. McCracken, New York city.
106,384.—PAINT BRUSH.—Alvid McDonald and J. M. White, Washington, Ill.
106,385.—HORSE HAY RAKE.—G. M. L. McMillen, Dayton, Ohio.
106,386.—MOSQUITO-NET HOLDER.—Charles Messenger, Cleveland, Ohio.
106,387.—GUIDE FOR CIRCULAR SAW.—Alexander Middlebrook, Glasgow, Mo., assignor to himself and J. B. Ruthvin.
106,388.—STEAM GENERATOR.—J. A. Miller, New York city.
106,389.—CARBURETING APPARATUS.—Joseph Millward, Fayetteville, N. Y.
106,390.—TILE CUTTING MACHINE.—O. F. Monfort, Dearborn, Mich.
106,391.—VENEERING PRESS.—John More, New York city.
106,392.—STEAM GENERATOR.—D. A. Morris, New York city.
106,393.—BOX.—John Nelson, Rockford, Ill.
106,394.—SELF-CLOSING COMPRESSION FAUCET.—Edward Noble, North Haven, Conn.
106,395.—FANNING MILL.—Harrison Ogborn, Richmond, assignor to Samuel Watson, Lewisville, Ind.
106,396.—PIANO ACTION.—C. F. Oliver, Lynn, assignor to Nathaniel Cummings, Boston, Mass.
106,397.—GROUND PULVERIZER.—E. A. Olleman, Mooresville, Ind.
106,398.—HAND STAMP.—W. E. Osborn, Brooklyn, N. Y.
106,399.—CAR COUPLING.—W. R. Patton (assignor for one-half his right to Denison Tisdale), Des Moines, Iowa.
106,400.—GOVERNOR FOR STEAM ENGINE.—A. J. Pevey (assignor for three-fourths of his right to G. F. Pottle), Boston, Mass.
106,401.—REFRIGERATOR.—Eliab Perkins, Fond du Lac, Wis.
106,402.—BOX FOR BLUING, ETC.—A. F. Pickens, New York city.
106,403.—SCHOOL DESK.—J. F. Piehl, Richmond, Ind.
106,404.—LATHE.—P. H. Pitts, Waverly, Mo.
106,405.—RAMROD STOP.—S. W. Porter, Springfield, Mass.
106,406.—WAGON BRAKE.—Asahel Quimby, Salem, Mass.
106,407.—COFFEE MILL.—F. C. Richer, Gilmer, Texas.
106,408.—PORTABLE IRON DERRICK.—Samuel Rider (assignor to himself, S. R. Griffith, and A. W. Cox), Oil City, Pa.
106,409.—POUNCING MACHINE.—John Rosenkranz, Boston, Mass.
106,410.—STOVE PIPE DAMPER.—W. F. Rossman, Hudson, N. Y.
106,411.—FARM GATE.—C. W. Saladee, St. Catharines, Canada.
106,412.—RAILWAY CAR BRAKE.—E. W. Sandford, Brooklyn, N. Y.
106,413.—PARLOR GRINDSTONE.—J. M. Simpson, Oshkosh, Wis.
106,414.—WASHER AND BOILER.—John Slater, Norwich, N. Y.
106,415.—TATTING SHUTTLE.—C. H. Smith, Brooklyn, N. Y. assignor to himself and T. D. Day, Bergen Point, N. J.
106,416.—CURTAIN FIXTURE.—R. I. Smith, deceased, Wolcottville, Conn.; Elisha Turner, executor.
106,417.—COTTON AND HAY PRESS.—W. M. Smith, Augusta, Ga.
106,418.—ELECTRO-MAGNET.—W. W. Smith, Cincinnati, Ohio.
106,419.—MACHINE FOR MAKING CHAIN-LINKS.—J. H. Snyder, Troy, N. Y.
106,420.—SLIDE CHUCK FOR LATHES.—C. F. Stackpole, Woburn, Mass.
106,421.—CUTTER-HEAD FOR PLANING MACHINE.—Darius Stevens, Danbury, Conn.
106,422.—DIAPER PIN.—I. W. Stewart, New York city.
106,423.—RAILWAY SWITCH.—J. H. Stockton, Thompson, Ga.
106,424.—WATER PIPE MACHINE.—J. W. Stockwell, Portland, Maine.
106,425.—BARBERS' FURNITURE.—Otto Stoelker, Montgomery, Ala.
106,426.—CLASP FOR LIGHTNING RODS.—Richard Street, Albany, N. Y.
106,427.—PRESS FOR HAY, COTTON, ETC.—G. W. Swinebroad, Bolivar, Tenn.
106,428.—BEVERAGE, OR "CHAMPAGNE MEAD."—A. S. Taylor, San Francisco, Cal.
106,429.—GEAR FOR CARPET-SWEEPING MACHINES.—G. F Taylor, New York city.
106,430.—DREDGE BOX.—A. F. Tripp, Buffalo, N. Y.
106,431.—SAW-FILING MACHINE.—William Tucker, Fiskedale, Mass., assignor to himself and P. A. Snell, Pittsburg, Pa.
106,432.—REVERSIBLE CENTER PINION FOR WATCHES.—Almon Twing, Waltham, Mass.
106,433.—PUMP.—Henry Van Keuren, Jersey City, N. J.
106,434.—RAILWAY.—Horace S. Weaver, Freeport, Pa.
106,435.—BASE-BURNING STOVE.—A. G. Webster (assignor to himself and G. T. Scudder), Troy, N. Y.
106,436.—CORN HUSKER.—Dwight F. Welsh, Bucyrus, Ohio
106,437.—VINE CUTTER AND TRIMMER.—H. W. White, Joppa Village, Mass.
106,438.—SAW-JACK.—Abel Whitlock, Danbury, Conn.
106,439.—MACHINERY FOR WORKING HIDES, SCOURING LEATHER, ETC.—T. R. Williams, Salem, assignor to Chester Guild, Jr., Boston, Mass.
106,440.—PRESS FOR BAILING BROOM CORN.—W. J. Wilson, Coles county, Ill. Antedated July 30, 1870.
106,441.—ROTARY STEAM PLOW.—J. T. Wilson, Rochester, N. Y.
106,442.—STOVE OR FURNACE GRATE.—G. A. Wing, Albany, N. Y.
106,443.—DITCHING PLOW.—Stephen Sidney Wood, Brooklyn, N. Y.
106,444.—HAY SPREADER.—Gilbert I. Wooster, Plymouth, Conn.
106,445.—PORTABLE BATH SEAT.—Allen P. Young (assignor for one half his right to Albert H. Spencer), Providence, R. I.
106,446.—QUILTING-FRAME HOLDER.—Nicholas Young, Parma, Mich.
106,447.—WOOD PAVEMENT.—Andy M. Adams, Washington, D. C.
106,448.—MANUFACTURE OF GLUE.—William Adamson, Philadelphia, Pa.
106,449.—MANUFACTURE OF WHEELS.—E. A. Archibald, Methuen, Mass.
106,450.—MANUFACTURE OF POCKET-BOOKS.—James C. Arms, Northampton, Mass.
106,451.—MANUFACTURING ENVELOPES.—James Ball, New York city, assignor to himself and Samuel Raynor & Co.
106,452.—EJECTOR AND STEAM CONDENSER.—Andrew Barclay, Kilmarnock, North Britain.
106,453.—CHURN DASHER.—Henry F. Bartlett, La Grange, Mo.
106,454.—AUTOMATIC LUBRICATING SLEEVE.—S. R. Bartlett, Chicago, Ill.
106,455.—FENCE.—William Bartlett, Little Hocking, Ohio.
106,456.—MODE OF ATTACHING SLEIGH-BELLS TO STRAPS.—W. E. Barton, East Hampton, Conn.
106,457.—COOKING APPARATUS.—Henry C. Berry, Wauseon, Ohio.
106,458.—MACHINE FOR CUTTING OFF SHAFTS AND PIPES AND FOR CUTTING SCREW THREADS.—George Blake, Whitby, Canada.
106,459.—LAST FOR MACHINE-SEWED TURNED SHOES.—L. R. Blake, Boston, Mass.
106,460.—DINING TABLE.—Minor P. Boyd, Unionville, S. C.
106,461.—TOY TOAD.—G. E. Bringman, Baltimore, Md.
106,462.—BREAD TOASTER.—Heman P. Brooks, Waterbury, Conn.
106,463.—DENTISTS' CHAIR.—William M. Butler, Louisville, Ky.
106,464.—COMBINED SHOVEL AND DUNGFORK.—Jesse Carpenter, Niconza, Ind.
106,465.—PRESERVATION OF MEAT AND OTHER ARTICLES OF FOOD.—Ferdinand Cassel, Cologne, Prussia.
106,466.—MACHINE FOR SPINNING FLAX, HEMP, ETC.—H. A. Chapin. Bridgeport, Conn., assignor to William Sparks Thomson, New York.
106,467.—WRENCH.—Sylvanus Chapman, Charlestown, Mass.
106,468.—BLOCK FOR CARPET PRINTING.—Thomas Crossly, Bridgeport, Conn.
106,469.—AXLE BOX.—David Dalzell, South Egremont, Mass.
106,470.—AXLE FOR VEHICLES.—David Dalzell, South Egremont, Mass.
106,471.—RAILWAY CAR COUPLING.—Jonathan L. Devol and Atwell L. Peadro, Parkersburg, West Va. Antedated August 4, 1870.
106,472.—PERMUTATION LOCK.—Charles Diebold and Jacob Obernesser (assignors to Chas. Diebold and Jacob Kienzle), Cincinnati, Ohio.
106,473.—VEGETABLE KNIFE.—Fred. Durand and Wm. F. Gilbert, Derby, Conn.
106,474.—MEDICAL COMPOUND FOR THE CURE OF GRAVEL.—T. G. Elswald, Providence, R. I.
106,475.—WRENCH.—Henry Fessler and Robert V. Jones (assignors to themselves and J. D. Graben, Canton, Ohio.
106,476.—BRUSH FOR CLEANING TUMBLERS.—Adolph Fischer, New York city.
106,477.—LOOM FOR WEAVING RATTAN.—S. L. Fitts (assignor to G. C. Winchester), Ashburnham, Mass.
106,478.—CULTIVATOR.—Julius Gerber, Rockford, Ill.
106,479.—COMPOSITION TO BE USED IN DYEING.—Franz Graupner, Evansville, Ind.
106,480.—RAILWAY SWITCH.—James T. Guthrie and Louis Pausch, Leesburg, Ohio.
106,481.—RUFFLING ATTACHMENT FOR SEWING MACHINES.—H. M. Hall, New York city.
106,482.—STALK AND KINDLING-WOOD CUTTER.—George B. Hamlin, Williamantic, Conn.
106,483.—HORSE POWER.—George B. Hamlin, Williamantic, Conn.
106,484.—FRUIT DRYER.—Henry Henley, Shoals, Ind. Antedated August 4, 1870.
106,485.—HOISTING JACK.—Frank Hollenberry (assignor to himself and John C. Frizzell), Frizzellburg, Md.
106,486.—JOURNAL BOX.—John Hughes, New Berne, N. C.
106,487.—COUPLING FOR WIRE RIGGING.—Wm. C. Ireland, Boston, Mass.
106,488.—SHOE.—Joseph L. Joyce, New Haven, Conn.
106,489.—HEMMING AND FELLING DEVICE FOR SEWING MACHINES.—Jacob Karr, Washington, D. C.
106,490.—BRICK MACHINE.—John Keller, Paduca, Ky.
106,491.—CENTRIFUGAL SUGAR-DRAINING MACHINE.—Hugh W. Lafferty and Robert Lafferty, Gloucester, N. J. Antedated August 5, 1870.
106,492.—WASHING MACHINE.—John L. Larose, Leavenworth, Kansas.
106,493.—ELECTRO-MAGNETIC MOTOR.—L. T. Lindsey, Jackson, Tenn.
106,494.—COMBINATION OF LABEL-HOLDER AND HANDLE.—Henry Manneck, New York city.
106,495.—SPRING FOR PISTON PACKING.—David Maydole, Norwich, N. Y.
106,496.—HANDLE FOR CASKET.—Alexander McGuire, Winchester, Conn.
106,497.—STEAM ENGINE.—Hermann Mohr, New York city.
106,498.—FLEXIBLE SHAFT.—James B. Morrison, St. Louis, Mo.
106,499.—KNITTING MACHINE.—Edward Morse, Winchendon, Mass., assignor to Hinkley Knitting Machine Co.
106,500.—SEEDER AND FERTILIZER COMBINED.—W. B. Myers, Hampton, Pa.
106,501.—NAIL.—Andrew Patterson (assignor to John Dean), Worcester, Mass.
106,502.—FIRE GRATE.—Merritt Peckham, Utica, N. Y.
106,503.—BASE-BURNING STOVE.—Merritt Peckham, Utica, N. Y.
106,504.—TOBACCO BOX OR DRUM.—John Potter, Quincy, Ill.
106,505.—HORSE-POWER.—Tapley B. Pyron, Springfield, Mo.
106,506.—DRIPPING PAN.—Adam Reid, Buffalo, N. Y.
106,507.—SHEAVE BLOCK.—T. H. Rice. Baltimore, Md.
106,508.—MANUFACTURE OF TRUSS PADS.—S. S. Ritter, Philadelphia, Pa. Antedated August 10, 1870.
106,509.—IRONING TABLE.—J. H. Ruff, Thomas Run Postoffice, Md.
106,510.—GRINDSTONE JOURNAL BOX.—J. B. Sargent, New Haven, Conn.
106,511.—MORTISING MACHINE.—G. T. Savary, Newburyport, Mass.
106,512.—PROPELLING APPARATUS.—Cornelius Schilling, New York city.
106,513.—HARVESTER RAKE.—Jacobs W. Schuckers, Philadelphia, Pa.
106,514.—TOWING HOOK FOR CANAL BOATS.—L. R. Shipman, Bloomsburg, Pa.
106,515.—SPARK ARRESTER.—Jas. Smith, Altoona, Pa.
106,516.—WASH BOILER.—Oscar F. Stedman, Westfield, N. Y.
106,517.—FIRE EXTINGUISHER.—Thomas Tripp, Chicago, Ill.
106,518.—COMPOUND FOR EXTINGUISHING FIRE.—W. P. Van Deursen, Cincinnati, Ohio.
106,519.—COMBINED LATCH AND LOCK FOR GATES.—H. R. Van Eps, Peoria, Ill.
106,520.—VEGETABLE CUTTER.—Franz Wagner, New York city.
106,521.—STOVE GRATE.—R. Ward, Edinburgh, Ind.
106,522.—VAPOR BURNER.—Thomas Ward, Columbus, Ohio.
106,523.—MOTIVE POWER.—William Medd Watson, Tonica, Ill.
106,524.—SADIRON.—William Webster, Washington, D. C.
106,525.—STEAM WATER ELEVATOR.—H. M. Wightman, Boston, Mass.
106,526.—THREAD CUTTER FOR SEWING MACHINES.—C. J. Wood, Brewerton, N. Y.
106,527.—WATER-PIPE SUPPORT.—C. D. Woodruff, Toledo, Ohio.
106,528.—VENTILATOR FOR STOVEPIPES.—C. D. Woodruff, Toledo, Ohio.
106,529.—VELOCIPEDE.—Chas. Wyndham, Southover Grange, near Lewes, England.
106,530.—APPARATUS FOR RECTIFYING ALCOHOLIC LIQUORS.—C. L. Fleischmann, Cincinnati, Ohio.

REISSUES.

4,098.—STOVEPIPE THIMBLE.—T. K. Anderson, Hornellsville, N. Y.—Patent No. 41,592, dated Feb. 16, 1864.
4,099.—MACHINE FOR HUSKING CORN.—L. A. Aspinwall, Albany, N. Y.—Patent No. 101,809, dated April 12, 1870.
4,100.—CAPSTAN AND WINDLASSES.—David N. B. Coffin, Jr., Newton, and Benjamin Woodward Somerville, Mass., assignees, by mesne assignments, of David N. B. Coffin, Jr.—Patent No. 59,969, dated Nov. 27, 1866.
4,101.—SAW MILL.—Alexander McCreight, Tranquility, O.—Patent No. 82,970, dated Oct. 13, 1868.
4,102.—CHILLS FOR CASTING CAR WHEELS.—Wm. Wilmington, Toledo, Ohio.—Patent No. 85,046, dated December 15, 1868.

DESIGNS.

4,293.—JOURNAL BOX.—P. P. Child, St. Louis, Mo.
4,294.—CARPET PATTERN.—John Dornan, Philadelphia, Pa.
4,295.—SHADE FOR GAS OR LAMP BURNER.—John Letchworth (assignor to Hartell & Letchworth), Philadelphia, Pa.
4,296.—HAND STAMP.—J. F. Pages, San Francisco, Cal.
4,297.—TABLE CASTER.—Daniel Sherwood and G. D. Dudley, Lowell, Mass.

NEW BOOKS AND PUBLICATIONS.

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Is the title of a new literary journal, edited by our talented young friend William F. McNamara. Its design is to furnish a journal of entertainment and instruction to Irish families—something elevating in its tendencies and teachings. The first number is a good one. It goes in for temperance, and eschews politics.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

MELODEON.—El Dora Louis, New York city, has petitioned for an extension of the above patent. Day of hearing Nov. 2, 1870.

ADJUSTABLE SEAT FOR CARRIAGES.—George Cook and David COOK, New Haven, Conn., has applied for an extension of the above patent. Day of hearing Jan. 18, 1871.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

1,987.—APPARATUS FOR REDUCING WOOD, METAL, AND OTHER HARD MATERIAL TO FIXED PATTERNS.—F. Baldwin, West Brattleboro, Vt. July 14, 1870.

1,988.—COUNTING REGISTERS.—W. H. McNary, Brooklyn, N. Y. July 14, 1870.

1,990.—SPOOL MACHINE.—J. F. C. Rider, ——, N. H., and E. P. Brownell ——, R. I. July 14, 1870.

2,000.—MACHINERY FOR MOLDING CLAY, ETC., INTO DRAIN PIPES AND OTHER ARTICLES.—P. S. Justice, PhiladelphiaPa. July 15, 1870.

2,030.—ROADWAYS, ETC.—H. Hughes, San Francisco, California. July 15, 1870.

2,050.—BASTERS FOR SEWING MACHINES.—F. T. Grimes, Liberty, Mo. July 20, 1870.

2,052.—OVENS.—Hosea Ball, New York city. July 20, 1870.

2,055.—RAILWAY CARRIAGE WHEELS.—A. F. Cooper, San Francisco, Cal. July 21, 1870.

2,097.—CANOPIES.—A. M. Rodgers, Brooklyn, N. Y. July 26, 1870.

2,101.—MANUFACTURING AND MOLDING SOLID COLLODION.—J. S. Hyatt and J. W. Hyatt, Albany, N. Y. July 26, 1870.

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The right to reject any and all bids is reserved.
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By order of the Quartermaster General.
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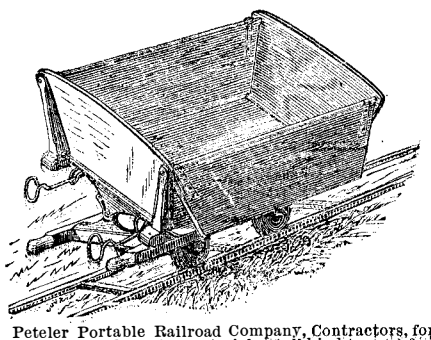

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NOTICE
RELATING TO ARTIFICIAL LIMBS.
WAR DEPARTMENT, SURGEON GENERAL'S OFFICE,
Washington, 15th July, 1870.

Congress having provided by Acts approved June 17 June 30, and July 11, 1870, for the reissue every five years of Artificial Limbs, or the value thereof in money, to officers, soldiers, seamen, and marines, who have lost limbs in the service of the United States, the following instructions are published for the benefit of those interested:
Applications should be made direct to the Surgeon General, from whose office the necessary blanks will be furnished on request.
Upon applications for limbs in kind, orders will be given by the Surgeon General, upon any manufacturer selected, who shall first have filed a bond in the sum of Five Thousand Dollars, with two sureties, to furnish good and satisfactory limbs, without extra charge to the soldier, and make good all defects of material or workmanship without additional charge, subject in all cases to the inspection of such persons as the Surgeon General may designate.
Blank forms of bonds will be furnished by this Office.
Transportation to and from the place of fitting the limb will also be furnished upon a written request addressed to the Surgeon General.
Applications for commutation will be certified by the Surgeon General, and transmitted to the Commissioner of Pensions for payment, through the local pension agents.
As full instructions will be forwarded from this Office, with the blank form of application, the expense of employing an Attorney or Agent will be in no case necessary.
J. K. BARNES,
Surgeon General U. S. Army.

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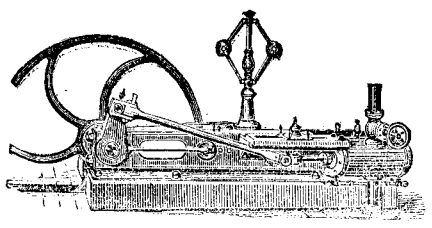

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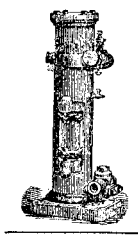

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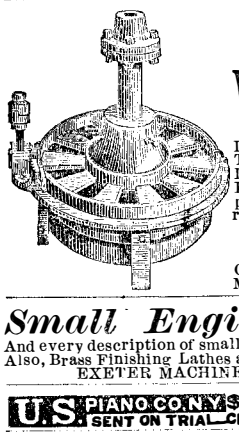

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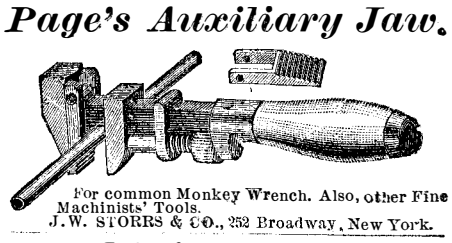

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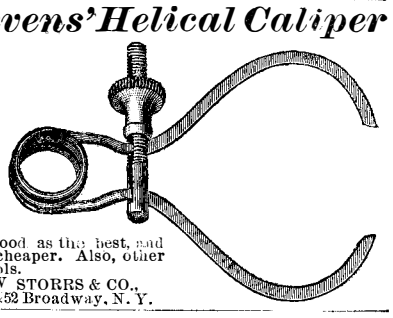

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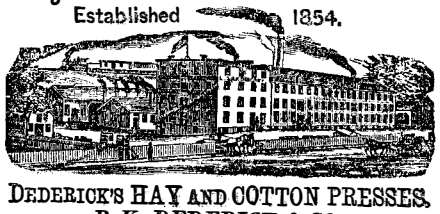

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By order of Quartermaster General.
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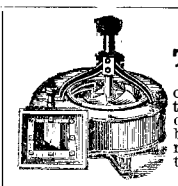

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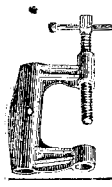

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